

July 7, 1958

Aviation Week

Including Space Technology

75 cents

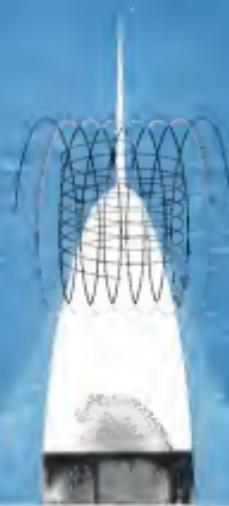
A McGraw-Hill Publication

Vertol Unveils
107 Turbine
Helicopter



Electronic Device Simulates Human Mind

FILAMENT WOUND STRUCTURES



BRUNSWICK CREATES TOOLS FOR THE CONQUEST OF SPACE

Today rocket and missile men are calling for nose cones with strength and stiffness values that were unheard of only yesterday. And these must be produced within seemingly impossible limitations of weight and maximums of strength. Not to mention the delicate and dimensional stability which must always be maintained to assure complete reliability.

Employing the super secret Strickland "B" process, Brunswick research and development teams take these incredibly complex assignments as a matter of course. For they are pacesetters whenever the technology of automated glass/reinforced plastics nose structural components are concerned. They come up with truly practical answers—every time!

As in the past, these same skills are also available for solving your problems in design, fabrication and testing of aircraft components in metal, boroncarb, conventional metalwork and reinforced plastics. For instant attention, write to: The Brunswick Biltte Cellular Company, Defense Products Div., 1700 Meader St., Muskegon, Mich.

BRUNSWICK

MAKES YOUR IDEAS WORK

PAGES FROM AN ENGINEER'S WORKBOOK



Requirement:

Optimum wheel for long-range version of our newest aircraft

Details:

Must have good roll life-best obtainable load-weight ratio no weight penalty

Solution:
Goodyear
Forged Wheels



Available in either magnesium or aluminum, depending on specific requirements Goodyear provides detailed advantages of each regarding weight and cost vs. performance.

AIRCRAFT NOW USING THEM:



Convair F-102, English B-70, McDonnell F-101, Grumman F11F-1, McDonnell F-101, Convair CF-102, Lockheed L-1649, Martin F-8.

THE SOUND ANSWERS COME FROM



GOOD YEAR
AVIATION PRODUCTS

TO ADVANCE YOUR PROJECT'S COMPLETION DATE

ADDRESS: Goodyear Aviation Products Division, Marion 10, Ohio, or Los Angeles 54, Calif.

HOW MAGNESIUM ALLOY SAND CASTINGS IMPROVE AIRCRAFT DESIGN

New thin-wall castings replace complex, costly fabrications

THIS number of magnesium alloy sand castings used in aircraft and missile structures is growing by leaps and bounds. One reason is the general recognition among designers that magnesium saves precious weight without sacrificing strength and rigidity. Two other reasons are also responsible for the rapid increase in the use of magnesium castings in aircraft design.

1. New elevated-temperature alloys
2. Simplified design, construction characteristics of magnesium sand castings

MAGNESIUM ALLOY SYSTEMS are now commonly used for magnesium sand castings—magnesium-aluminum-nickel, magnesium-nickel-manganese-titanium, and magnesium-nickel alloys.

These alloys have excellent pressure tightness as well as good creep strength at temperatures up to 600°F. The magnesium-nickel system is particularly good for short time elevated-temperature uses where high stresses are encountered. ME3MA is excellent for low stress performance over a long period of time. Both have creep characteristics superior to the Mg-Al-Zn and Mg-nickel-manganese alloys, and both are suitable in the heat-treated condition.

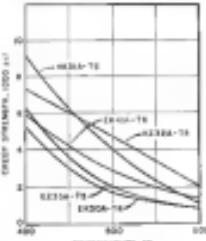
Magnesium alloy sand castings are being made in a large variety of shapes and sizes, ranging from a few ounces to over 1000 lbs. The favorable casting characteristics of magnesium in general permit unusual flexibility in design.

THIN-WALLED SECTION, for example, can be produced to replace intensive fabrication involving several operations. Although thin walls are usually kept small in area, new techniques have been developed to obtain large thin-walled sections with better than average surface quality.

For more information about magnesium sand castings and their use in aircraft design, contact your nearest magnesium foundry or Dow sales office.



TYPICAL THIN-WALLED magnesium casting used in a missile control surface.



MAGNESIUM DESIGN, a 128-page handbook discusses all phases to design products, standard design, product design, including castings and roll products. Information and Building Design section of tables on properties, dimensions, etc. For you copy contact a Dow sales office or write to our home offices, Midland, Michigan, Department MA-1450.



YOU CAN DEPEND ON



AVIATION CALENDAR

July 28-Aug. 1—Canadian National Seating Manufacturing Division, Canada, Annual Sales & Marketing Meeting

July 28-Aug. 1—Advanced Feedback Control Theory Research Special Seminar, Graduate Aeronautical Institute of Technology, Cambridge, Mass.

July 29-Aug. 1—Regional Meeting, Society of Naval Engineers and Technical Airlines, Denver, Colo.

July 24-25-26—Annual Symposium on Computer and Data Processing, Marine Hotel, Denver, Colo.

Aug. 1—Intergovernmental Technical Meeting on Space Exploration sponsored by American Rocket Society and the Institute of the Astronautical Sciences. For details, R. D. LARUE, General Chairman, Space Exploration Meeting, 1000 N. Halsted Street, Chicago, Ill.

Aug. 1-2—International Conference on Sea Level Magnetics and Magnetic Anomalies sponsored by the National Institute of Standards and Technology, Hotel Statler, Las Vegas, Calif.

Aug. 7-9—National Conference on American Seaports for Clean Growth, Western Region, T-3 Center Hotel, San Diego, Calif.

Aug. 7-9—National Conference, DPA Club of America, Hotel Statler, Las Vegas, Calif.

Aug. 7-12—Military Displays Symposium, West Central College, Cedar Rapids, University of Minnesota, Minneapolis, Minn.

Aug. 13-15—Conference on Electronic Standards and Measurements, National Bureau of Standards, Boulder Laboratory, Boulder, Colo. Sponsored by NBS, American Institute of Physics, U.S. Bureau of Standards, and Institute of Radio Engineers.

Aug. 13-15—Second Annual Conference on Technical Applications of X-Rays, American X-Ray Show, Hotel Del Coronado, Calif. (Continued on page 61)

AVIATION WEEK Industry News Technology

July 7, 1958
Vol. 88, No. 1

...and the story continues. In the July 7 issue, we presented a feature article on the development of the CEC 1375-N7 transducer. This device is a reliable transducer family built to operate at low pressures up to 250 psi...to measure differential pressure in ranges from ±7.5 psid to ±50 psid, and gage pressure in ranges from 7.5 to 50 psig...and to meet all specifications without external compensation of any kind. Check these specs:

high output

at less cost

with a miniature

pressure pickup

Smaller than a dime, but a real trap if you're looking for top performance in airborne applications...this is the story on the Type 4-130 Pressure Pickup. This tiny member of CEC's reliable transducer family is built to operate at low pressures up to 250 psi...to measure differential pressure in ranges from ±7.5 psid to ±50 psid, and gage pressure in ranges from 7.5 to 50 psig...and to meet all specifications without external compensation of any kind. Check these specs:

Sensitivity	±0.05 mm mercury
Temperature Range	-58°F to +230°F
Acceleration	50 Gals/min. to 200 Gals/min.
Construction	416 stainless steel
Size	0.250" x 0.475" diameter
Weight	4 grams

Call your nearest CEC sales and service office for the details, or write for Bulletin CEC 1375-N7 (which is not only free, but extremely interesting).

Transducer Division

Consolidated Electrodynamics

100 North Barron Madero Villa, Pasadena, Calif.



RECOGNIZED LEADERS IN GAUGES/POTENTIOMETERS—TELEMETRY, PRESSURE AND VIBRATION INSTRUMENTATION

G.E. REDUCES PREMATURE BURNOUTS

*to cut down your landing lamp
replacement costs.*

Replacement charges for landing lamps are high. "Grounded" starts because of burnouts is even more expensive—and aggravating.

General Electric has done two things to landing lamps to keep both these expenses to a minimum:



**1 RUGGED COILED-COIL
FILAMENT**—needs no support wire to prevent sagging, eliminates premature failures caused by "sawing action" of support wire and filament.

2 METAL STRAPS—make each filament its own lead wire, insure constant beam aim.



Beam pattern is improved, too, because the compact filament is precisely designed and located to give a more intense pattern of more even intensity. Yet G-E lamps cost no more—actually cost less in terms of longer burning hours in service.

Ask your G-E Lamp distributor about landing lamp 6319—or write General Electric Co., Marine Lamp Dept., AW 28, New Park, Cleveland 12, Ohio.

Progress Is Our Most Important Product

GENERAL ELECTRIC

AVIATION CALENDAR

(Continued from page 53)

Aug. 21-22—Welles Operation Research Progressing Seminar, Pennsylvania State University, University Park, Pa.

Aug. 24-26—Annual Technical Meeting, Institute Astronomical Society, Royal Observatory Greenwich, Standard Union, 30 Pall Mall, Calif.

Aug. 29-30—Marine Electronics Show & Convention, Broadcast Radio Engineers, Veterans Hotel, Los Angeles, Calif.

Aug. 25-30—North American Congress, International Astronomical Union, San Fernando, Holland

Sept. 3-7, 1955—Engineering Flying Display and Exhibition, Society of British Aircraft Constructors, Farnborough, Eng.

Sept. 4-12—Partners of High Priority, Air Force Design Project, Muroc, Calif., Institute of Technology, California, Muroc (Government liaison, reported).

Sept. 5-9, 1955—Cognac Engineering Conference, Vichy, France, Institute of French Aeronautics.

Sept. 8-10—First International Congress of the Astronomical Society, Palma, Spain, Madrid, Spain

Sept. 9-11—Second National Conference on Applied Mathematics, Worcester Polytechnic Institute, Worcester, Mass., Chairman Dr. J. P. Teller, Vice-Chairman, Engineering Dept., University of Michigan, Ann Arbor, Mich.

Sept. 15-16—Fall Meeting, American Rocket Society, Inc., Hotel Statler, N.Y.C.

Sept. 15-16—Annual Instrumentation Conference & Exhibition, International Institute of Science, Philadelphia Convention Hall, Philadelphia, Pa.

Sept. 20-24—1955 Meeting, Professional Group on Ultraviolet and Radiant Control, Americana Hotel, 61 Hudson Street, New York.

Sept. 21-24—Fourth Annual Meeting, Materials Research Society, Research Triangle Park, North Carolina, Pa.

Sept. 25-26—1955 Annual Seminar of West Coast Aerospace Engineers, Lockheed Aircraft Corporation, Los Angeles, Calif.

Sept. 29-Oct. 1—National Industrial Metal Meeting, Society of Metallurgy Engineers, Inc., the Ambassador Hotel, Los Angeles.

Sept. 29-Oct. 1—Electro-Aerospace Meeting and Defense Conference, Stevens Institute of Technology, Hoboken, New Jersey, Hill Auditorium, Calif.

Oct. 6-7—National Symposium on Electrical Steel and Strips, Universities, sponsored by the Professional Groups on Advances and Progressions and Communications Services of the Institute of Radio Engineers and Meetings, McGraw-Hill Building, 1221 Avenue of the Americas, New York 20, N.Y.

Oct. 7-8—1955 Joint Meeting, Institute of the Scientific Schools and Councils Scientific Institute, Chinese League, Ottawa, Canada.

Oct. 22-24—1955 National Vacuum Symposium, St. Francis Hotel, Hotel San Francisco, Calif.

Oct. 27-28—Joint Council Meeting of the International Air Transport Ass., New York, N.Y.

Oct. 27-28—First Coast Conference on Aeronautical & Navigation Electronics, Inc., Inc., Inc., 3000 E. 3rd Street, Radio Institute, Los Angeles, Calif., Inc., Inc., Inc.

Oct. 27-28—1955 Meeting, Institute of the Scientific Schools and Councils Scientific Institute, Chinese League, Ottawa, Canada.



SUNDSTRAND HYDRAULIC MOTOR POWERS CABIN PRESSURIZATION DRIVE



Photo: Sundstrand model 502AA-421, fixed displacement hydraulic motor used in altitude control. Drive is a standard motor differing from 502A-420 in having a higher torque rating. The torque rating is 18 ft-lbs at 2000 rpm. 1775 lb-ft/mm hydraulic horsepower from 2000 rpm and rated speed. Ans. No. 502AA-124.

Aero Design and Engineering Co. has selected, on a basis of component performance, a Sundstrand Aviation hydraulic motor to power the cabin pressurization drive of its new Alti-Cruiser.

Sundstrand aircraft hydraulic motors provide long life at continuous duty, high horsepower to weight ratio, high overload capacity, and high operating speed. These characteristics, combined with a wide selection of displacements, make the right motor for powering a broad range of aircraft requirements.

Other features include few component parts, small envelope, continuous operation at 5000 rpm at rated speeds, high overload capacity to 3000 rpm on intermittent loads, and high torque to mass ratios for rapid starting or rapid reversing.

For complete information on Sundstrand hydraulic pumps, motors and controls, send direct to Sundstrand Hydraulics, Inc., 1000 Madison Avenue, White Plains, New York.



SUNDSTRAND AVIATION

Sundstrand Corporation, Inc.
5111 Beverly St., West Hollywood, California.

District Offices in Atlanta, Texas, Hawthorne, California, Seattle, Ontario, Bedford, B.M.C., Seattle, Washington, Stamford, Connecticut, Washington, D.C.



THE ELECTRICAL CONNECTOR THAT "WASN'T FOR SALE" BECAME A MAJOR PRODUCT

This is a marine step in the true American tradition. It started during World War II. Engineers here in Scintilla Division of Bendix Aviation Corporation had a problem. The supply of electrical connectors for the aircraft ignition systems we were building was irregular and unpredictable. Not sure we satisfied with the performance when we could get them.

The engineers set out to design the finest electrical connectors available anywhere. We produced them and used them widely in our own plants. But they were too expensive to sell. Then we decided to make them available in quantity to industry who could use them.

We hope you are already familiar with Bendix electrical connectors. If you're not, may we offer our assistance in solving any connector problems. Write or call:

In the best of plant experience in our facilities, to be devoted to the production of finer and better electrical connectors.

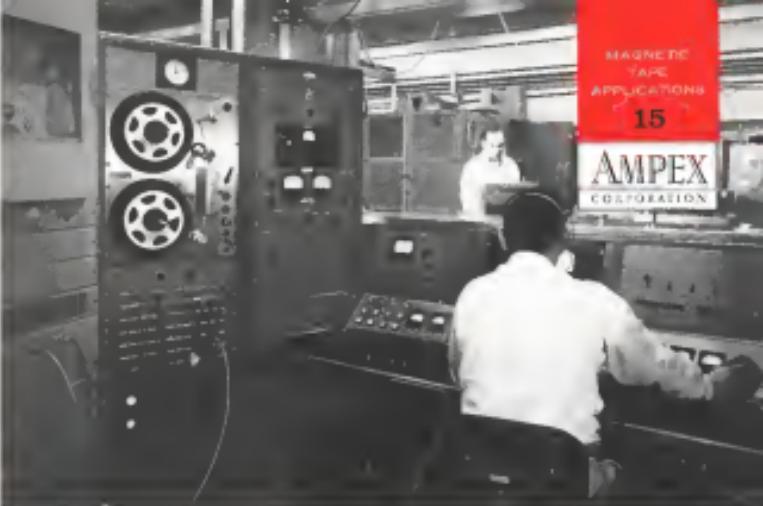
We are proud for the recognition of quality which is reflected in your acceptance of Bendix electrical connectors. We are happy to assure you that, while our new facilities will mean even larger connector production in the future, we shall continue to place greater emphasis on quality than on quantity.

We hope you are already familiar with Bendix electrical connectors. If you're not, may we offer our assistance in solving any connector problems. Write or call:

Bendix Aviation Corp.,
Scintilla Division,
1000 Lexington Blvd., Belmont, Calif. 94002



A few of many types and sizes of connectors available from Scintilla Division. Our engineers are ready to aid you with the most demanding connector requirements.



How to improve component reliability by better shake tests

Magnetic tape simplifies complex-wave testing and lessens human error



THE WAY TO OUTGUESS THE UNKNOWN

Is simple sine-wave vibration testing sufficient? Or is a closer simulation of the article's actual vibration environment necessary? Bendix says act the sine. Standard acceleration often strengthens knowledge more thoroughly than the complexities of a realistic test itself. Bucket components can bear the weight of excess inertia faster than the risks of complete — reasons why JPL chose random noise and complex waves.

Vibration tapes from actual missile flights are often used as shakers to assist development of test procedures. But this is not a complete answer. Different flights yield different vibration environments. A sine-shake test-programming tape is a synthesized composite or envelope of the most severe conditions from many flights. This tape often contains a variety of envelope velocity and amplitude waves from aerodynamic, propulsive and structural sources. And just as the missile's mass, velocity and surrounding atmosphere will change rapidly with time — so the taped program must change.

Once no magnetic tape, any test program stops instant. It is especially useful before a final check-out or low-cycle fatigue testing. With a tape, a tape recorder, and a tape reader, there is little chance that an operator will accidentally create destructive forces by errors in frequency or gain settings. Tape eliminates source possible sources of human error. It also leaves personnel free to concentrate on other requirements of shaker operation and test observation.

TAPE PASSES ALONG THE "IDEAL" TEST

So far as contractors and subcontractors will run desired shake tests correctly on the components they furnish, California's JPL frequently results from programs tapes. These same calibration checks in addition to the program itself. Then a similar shaker-table setup on the outside of the country can quickly duplicate the exact test in JPL's own laboratory. The tape lessens chances of misinterpretations and subjective factors.

As quantity production of missile components gets under way, magnetic tape offers a means to run optimum shake tests on large numbers of components at widely separated manufacturing sites. From copy-tapes test programs of complex waves can be run almost in series in a simple remedial zone. Individual wave and noise have equipment to generate their own shaker-control programs. Frame excitation or search-co-excitation can handle the tapes. And since a tape number of duplicates can be made, a well-entitled test program can include variations.

May we send you our 16-page brochure on magnetic-tape instrumentation plus further information on the use of tape for vibration testing? Write Dept.

Scintilla Division
BENDIX AVIATION CORPORATION



AEROJET for rocket power: the Navy's Polaris

The powerplant for the submarine-fired POLARIS will be an Aerojet solid-propellant

rocket engine developed and manufactured at our Solid Rocket Plant near Sacramento.



AEROJET-GENERAL CORP.

A SUBSIDIARY OF THE GENERAL TIRE & RUBBER COMPANY

Logistics Division—Missile manufacturing opportunity at Aerojet (Offices in Akron and near Sacramento, Calif.)



HIGH-CAPACITY CENTRIFUGE Capable of handling 100 g and subjects up to 100 g's constant acceleration.



ALTITUDE CHAMBER Capable of maintaining altitudes up to 100,000 feet. Temperature range -50° F. to +120° F. Humidity up to 90%; expansion rate 10% per sec.



SALT SPRAY TEST CHAMBER Capable of temperatures from 30° F. to 120° F., humidity to 100%; specimen capacity up to 100 cubic feet.



EXPLOSION CHAMBER Capable of temperatures from 60° F. to 120° F., altitudes to 10,000 feet, capacity 50 cubic ft.

ACOUSTICS • IMPACT SHOCK • ACCELERATION

VIBRATION • TEMPERATURE • ALTITUDE
HUMIDITY • SAND AND DUST • EXPLOSION
PENETRATION • SALT SPRAY • RADIATION • RADE

Additional information and a copy of Bulletin RL-1, "Environmental Test & Analysis", can be obtained by contacting Sales Manager, Special Weapons Division, Zone 8204, BELL AIRCRAFT CORPORATION, Post Office Box One, Buffalo 3, N.Y.

BELL
aircraft

Special Weapons Division

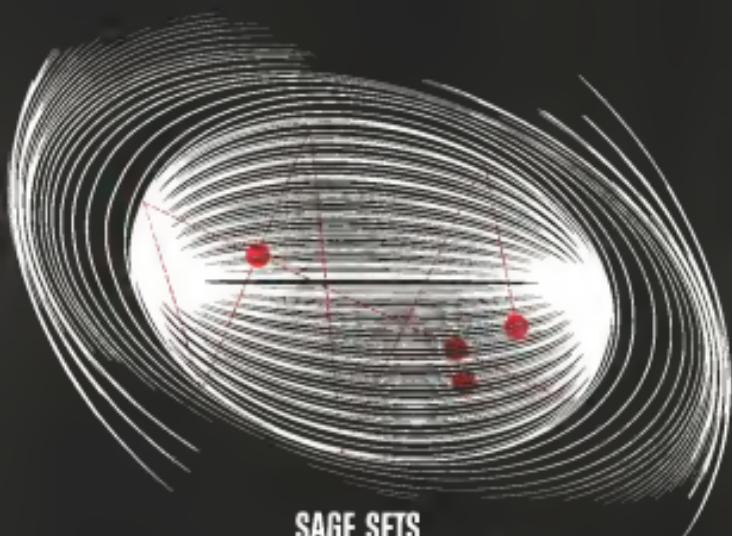
BUFFALO, N.Y.

ENVIRONMENTAL TESTING & ANALYSIS

to foretell the performance
of your products under actual
service conditions

The personnel and facilities of Bell Aircraft Corporation's General Engineering Laboratories are now available to you in testing and analyzing the performance of materials, components, systems and packages under environmental conditions duplicating those which will be encountered in actual use. Years of operational behavior frequently can be simulated in hours in the laboratory.

Extensive and diversified experience in such fields as acoustics, cleanness, material physics, servomechanisms, guided missiles, rocketry and aircraft currently qualifies Bell engineers to handle your most exacting assignments quickly and competently. Qualified Product Line (QPL) testing and Military Specifications are available. All equipment used complies with the requirements of MIL-E-5222A.



SAGE SETS AN ELECTRONIC BEAR TRAP'

BURROUGHS ELECTRONIC DATA PROCESSING EQUIPMENT STANDS WATCH FOR OUR CONTINENTAL AIR DEFENSE

Problems of fast airmobile speeds and range that involved our military defense systems can only be solved by the quick and accurate assessment of electronic equipment such as found in our Semi-Automatic Ground Environment—SAGE, which is now becoming operational! As a result, Burroughs vital data

processing equipment fills important posts along our peripheral continental approaches.

This major U.S. Air Force contract is one example of the initiative and competence in Burroughs Corporation's 20 year track record of reliability in computing. It demonstrates Burroughs' new breadth in the development of electronic equipment and its continuing competence from research to final installation.



Burroughs Corporation
"NEW DIMENSIONS in electronic and data processing systems"

NEW ICEFOIL

Meets requirements of MIL-D-8181 plus 2000 cps @ 15G
Vibration Test plus 1450 ft.-lb. Ice-Ball Impact Test

The new Aeroproducts ICEFOIL is specially designed for installation in the intake duct of gas turbine engines. Combining simplicity of design with minimum weight and maximum strength, the ICEFOIL offers a truly modern ice detection system for jet-age military and commercial aircraft.

In standard NACA airfoil shape cuts drag and air turbulence to a minimum. Its positive/positive pressure system provides a break-in fail-safe feature - gives longer life with greater reliability.

Requiring no periodic calibration or adjustment, ICEFOIL presents ice warning in the cockpit or automatically activates de-icing systems at speeds from 50 to 550 knots.

Currently in production for the Douglas DC-8 commercial jet transport, ICEFOIL is available for immediate application on engines, airframes, missiles and rockets.

Building for today. Designing for tomorrow.

Aeroproducts

ALLISON DIVISION OF GENERAL MOTORS
DAYTON, OHIO





BIG EXTRUSIONS

...from Harvey Aluminum

improve design

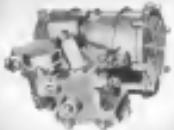
reduce weight

lower assembly costs

A major inhibitor product of tritium-iodine is aP effluent sites. By super Adds and that pipeular hollow section area. Before, before work, before being a product isolated for the successive stages, light and heavy process sites were considered and ultra-filtration products. Finally, provide separation, separation and test. PLANTER ALUMINUM SALES, INC., THERESA, California.

HARVEY
Aluminum

**Holley
engine
controls
selected for
JT4 engines
on America's
first jet
airliner**



PIPER PISTON ACTUATOR



中国科学院植物研究所植物学大系网



Powered by four JT4 Pratt & Whitney Axial-spool engines, the Boeing 707-320 will carry 121 first class passengers from New York non-stop to the Continent in just over six hours.⁶ Each of these new engines, considerably more powerful than the 707's which drives many of America's latest jet fighters, delivers up to 13,000 pounds of thrust. Ability to pack so much added power into a relatively small space is the result of designing engine components which will operate at higher efficiency, require less

For military applications, the Halley main fuel control piston is a suspension part to the aircraft and vehicles.

governor actuator: For single and multi-engine military aircraft, the Holley main fuel control is a component unit to the Holley governor and actuator.



HOLLEY
carburetor Co.

1915 E. New Milford Street, Warren, Michigan
Leave in the summer, December and March.



HOW MODERN T58 POWERPLANT HELPS PROVIDE . . .

700 Lbs More Payload Capacity

NEW SIKORSKY S-62 COMBINES PROVEN HELICOPTER COMPONENTS WITH PROVEN GENERAL ELECTRIC T58 TURBOSHAFT ENGINE

Sikorsky's newest helicopter combines the components of its famous S-58—proven in 1,000,000 flight hours—with modern General Electric gas turbine power, supplied by the compact, high performance T58. The result: a helicopter that provides 700 lbs more payload capacity . . . and more cabin space to carry it in . . . than the S-58.

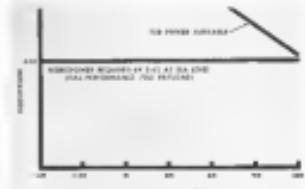
Capable of operation from either water or land, the S-62 is a highly versatile helicopter. Powered by a single T58, the S-62 will be qualified to perform a wide variety of missions. It will provide . . .

. . . increased hovering stability. Today's helicopters require about five minutes warm-up time. The T58 turboshaft requires no warm-up.

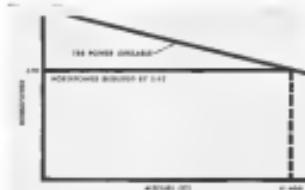
. . . more power for hot weather flight. From its single T58, the S-62 will have substantially more horsepower than the S-58, especially for high altitude or hot weather flight.

. . . unequalled hovering stability. The T58 will provide the full power required by the S-62 up to 17,000 feet.

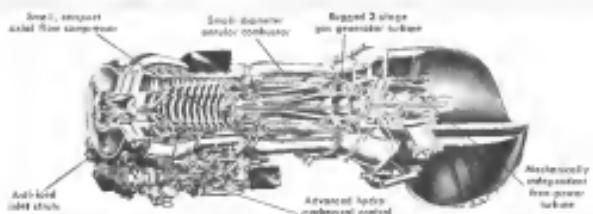
The S-62 is another striking example of the performance improvements that can get with the modern T58 turboshaft—the engine which provides more horsepower per pound of weight than any other shaft engine flying today. For new T58 technical information brochure, write to: General Electric Co., Section 233-10, Schenectady 5, N. Y.



Regardless of temperature, T58 will automatically provide full the total horsepower it requires at sea level for full performance, full payload. In addition, operating the T58 at less than top design horsepower increases engine life.



At altitude up to 17,000 feet, T58 will supply full horsepower requirement of S-62 . . . help insure unequalled hovering ability. This outstanding altitude and fuel efficiency performance is possible with one engine being a level of performance attained only by the T58.



General Electric produces T58 delivers 1000 shp, weighs only 271 lbs without 75-lb annual reduction gear. Its new

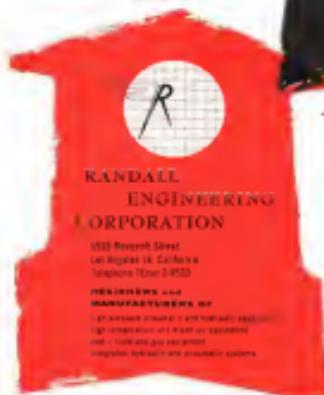
4 to 1 power-to-weight ratio, 0.64 SFC give added insurance of top helicraft performance.

Progress Is Our Most Important Product

GENERAL  **ELECTRIC**

IN
THE
COURSE
OF
EVENTS

API*



Courtesy, Randall Engineering Company

* A PROGRESSIVE INGREDIENT - DIRECTION CONTROL

- regulating inlet pressure 150-5000 psi
- outlet pressure 50-1000 psi
- flow rates 1,500 lbs/min
- extremely fast response and lock up range
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EDITORIAL

USAFE's Mercy Missions

Nation troops and their families from Denmark, Norway and Finland to the Naples staging areas of the force that policed the Sarajevo battle zone.

The 32nd Air Division and other USAFE transport aircraft also provide an annual "Kinderlift" which for the past five years has transported German refugee and underprivileged children from Berlin to West Germany for vacations in the country. This "Kinderlift" is operated in cooperation with the German Red Cross and provides safe passage for refugees from East Germany who could not travel safely by land through the Soviet occupied area of Germany. Last year 2,000 children were given sound trips by air from Berlin. The 32nd also operates a medical air evacuation squadron that does emergency missions for American tourists stricken abroad. Bring them to the nearest hospitals that can handle their problems.

All of these activities of course provide excellent training for the 32nd air and ground crews and increase the value of their transport aircraft. But they are also building a highly needed reservoir of European good will and respect with these spectacular and useful mercy missions.

Price of Progress

The crash of the Boeing KC-135 jet trailer shortly after takeoff from Westover AFB on an attempted record breaking run to England was one of those tragedies that inevitably punctuates the story of advancing technical progress. Aviation lost some devoted contributors to its technical progress and public understanding in this accident.

We think Gen. Thomas White, USAF Chief of Staff, expressed the thoughts of so many in this business and who personally know many of the men involved when he wrote:

"The mission on which those men had embarked was a stupendous one in every aspect except that it was also a demonstration; it was a demonstration of a new capability of the United States Air Force as one of the principal guardians of world peace. In order that the people of the United States and of other nations can know and understand the steps by which we are diminishing the time and space that separate the nations of the Free World, we have often shared these notable experiences with men who are trained to observe and to report them. As we share with these men the conquest of time and space, they share with us the dangers of that conquest."

"This unfortunate accident serves as a reminder to all of us that the men who observe and report the achievements of science and skill that are so necessary to our survival, are partners in these achievements. They are also partners in the sacrifices that sometimes are the price of progress. The men who represent the world's need to know, and to profit in and live since the dangers and the fate of our men in uniform, are equally worthy of the nation's gratitude."

-Robert Hiltz



Seventy-five Years

THREE WAS a growing surplus in the United States Treasury—the Polygamy Act was passed—silver postage was refused from three cents to two cents—the Brooklyn Bridge was opened—standard time was adopted—in 1883, when two young men, just graduated from Worcester Polytechnic Institute, established the business bearing their names—WYMAN-GORDON. The total capital was \$27,000.

Integrity, initiative, ambition and ability were there. Endowed with these qualities and privileged to operate

under that unique American system of free, private, competitive enterprise the Company prospered and grew.

On this our 75th anniversary, we salute the spirit of our founders and we pledge our every effort to help preserve, expand the steady erosion of the last quarter century, that system which has made our nation what it is today and which has enabled us to lead the greatest industrial production in the world, reaching on the highest standards for all segments of our people.

WYMAN-GORDON COMPANY

ESTABLISHED 1883

FORGINGS OF ALUMINUM • MAGNESIUM • STEEL • TITANIUM

HARVEY, ILLINOIS • WORCESTER, MASSACHUSETTS • DETROIT, MICHIGAN

WHO'S WHERE

In the Front Office

Lester F. Frost, board chairman, and Harry Coplow, senior vice president, Bell Aerospace Corp., Melville, N.Y.; Mr. Frost also is president of the company, and Mr. Coplow continues as president of Bell Helicopter Corp., Ft. Worth, Tex.

Leno F. Ebel, board chairman, Fairchild Aircraft Stores, Inc., Los Angeles; Carl Biggs, Edisons M. Day (1954); and John C. Gandy, president, president.

Henry M. Bloch, vice president, Surface Combustion Corp., Toledo, Ohio. Mr. Bloch also elected president of the corporation's Industrial Aircraft and Industrial Maintenance Divisions, Toledo, Ohio.

Frank J. Capponi, recently vice president, Fisher, Inc., subsidiary of Fahey-Aerospace Corp., Buffalo, Calif.

John Tolis, executive vice president, Standard, Inc., Ft. Worth, Tex.

Cliff R. McLean, vice president-engineering, California Electric Power Substation in name of Testline Int., Belmont, Calif.

Maria F. Burke, vice presidential manager, United Atomic Corp., East Hartford, Conn.

John Morris, vice president, Virgil Air Corp., Cranberry, Pa., Pittsburgh, Conn.

McLane B. Smith and James W. Beckwith, vice presidents, International Business Machines Corp., New York, N.Y.

W. W. Hwang, vice president-marketing, Eason-Compton Corp., Elkhorn division of Dresser Industries, Inc., Elkhorn, Wis.

H. G. Mandel, managing director, Research and Int'l., Rheinstahl, Hamburg, West Germany.

Honors and Elections

The Royal Astronomical Society, London, England has elected the following as vice presidents of the Council for 1958-59: Air Cmdre F. R. Boulton Asst Marshal Sir Owen Jones and E. S. Mott. P. G. Montford, managing director of British Aerospace, Ltd., has been elected vice-president of the Society for 1959-60.

J. Paul Webb, Deputy Director of the Navy's Project Vanguard, has been honored as Senior Doctor of Engineering degree by Stevens Institute of Technology "for his leading role in the development of missile technology."

Changes

Thomas Conroy, Jr., chief engineer on the Convair B-58 Hustler, San Diego, Calif., Paul A. Whaley, Vice President of United Aircraft Corp., has assumed the following change: Bernard A. Schmidkau, engineering manager engine division, Waltham, Mass., assistant engineering manager engine division; Richard T. Bannister, engine production engineer, Richard L. Goss, chief engineer advanced projects (Fluidics facility). Walter Dell, assistant chief engineer advanced projects (West Martindale facility); C. T. Moore, sales case repair engineer; Bert J. McNamara, management and special parts sales.

(Continued on page 100)

INDUSTRY OBSERVER

►Atlas intercontinental ballistic missile incorporates propellant inflation system which expels both tanks simultaneously so that when inflation rates loss out there is no dead weight remaining.

►North American Aviation Missile Development Division's Dyna-Soar proposal concerned uncrewed test vehicle and fuel savings regimen. Special group from company's X-15 out-of-atmosphere rocket-strike project participated in formulation of proposal.

►Mustang, an turbine-alternator unit weighing about 15 lb. is being used in conjunction with Arco Enzinger's Martin 388MA-12 Laramie surface-to-surface missile. Produced in Preparation Research Corp. under Los Angeles patent, turbine-alternator is an spotter's back, to forward position and power equipment for countermeasures link to missile firing site. Martin has produced 1,000 Laramie missiles.

►Award of new cone contract for Bellanca Marine Division's Martinique ICBM is scheduled to be made by end of this month. Proposals have been submitted by General Motors Corp., General Electric Co., Douglas Aircraft Co., Arco Research Laboratory, and Pratt & Whitney Co., whose subsidiary, Aerostatic Systems Inc., prepared Fort's submission in the bidding.

►New cone of intermediate-range ballistic missile proved in even better manner of vibration energy during lengthy tests had been incorporated in recent tests on Avco's Jupiter, strengthening the case for using infrared tracking in ballistic missile defense.

►Next major Air Force Modernization Board industry design competition will be for development of fast refueling and enroute refueling equipment (TRACES) intended to speed slow and unsupervised refueling of aircraft movements at the terminal. AMBL funding for backlog will be held July 8.

►Republic Aviation is proposing a modification kit to convert all of its F-84E and F-84F models now in widespread NATO service to guided bombs with a servo tail launcher, a guidance system and provisions for both nuclear and conventional warheads.

►Solid propellant producers are showing great deal of interest in ultra fine grade of aluminum powder being offered by National Research Corp. First evaluation by missile contractors reports favorable on catalyst's potential in an air-breathing assistance (NACA June 23, p. 47). Catalysts of one type of powder sizes of 7 to 8 microns diameter of new aluminum powder are estimated to be below 0.1 microns and are thought to be much smaller. Essentially straight aluminum, the new powder is air propellant, has a density of 15 lb./cu. ft., and sells for \$35/lb. at free-powder lots.

►Ultrasonic method is being considered as effective means to solve difficult problem of determining cracks, discontinuities and other defects in solid propellant rocket motors for ballistic missiles.

►Development study has started on small solid-propellant auxiliary power unit with rating equivalent to 10-15 hp. for hydraulic and electrical services in missiles at Precision Research Corp., Curtiss-Wright laboratory, Santa Monica, Calif., to produce substantially higher efficiencies than available with small liquid-gas turbines.

►National Bureau of Standards plans to extend its research in high energy fuels to include ion propulsion. NBG uses explosives-free rolled sheets.

►North American Aviation is considering establishment of space physics laboratory in its missile development division, Downey, Calif., to strengthen its position in burgeoning field of space technology.

►East Marine Titan ICBM is to be delivered to Air Force's missile test center at Cape Canaveral and will facilitate nozzle for general handling practices at site. Unit will be incomplete, probably will end up being contributed.



**HOW THE SILIGONES MAN HELPED...
MAKE THE TAPE THAT FORMS A PERFECT SKIN**

Wind a fully cured tape of this new silicone rubber around a cable . . . , in a short time it turns into a homogeneous mass! Press a molded or extruded piece of this rubber into position and it will stay firmly in place. From research at UNION CARBIDE, the Silikonex™ Men bring you the world's first plastic silicone rubber.

This new product has all the properties usually associated with precision silicon rubber... outstanding high temperature performance, good electrical and oil resistance, excellent inversion resistance among them. You can well imagine the many applications in electronic gear, high temperature

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SILICONES

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Washington Roundup

Bomb Powered Rocket

Propagation through the use of a series of controlled nuclear explosions is suggested in a study by General Atomic Division of General Dynamics Corp. has been accepted and funded by the Advanced Research Projects Agency [see box, p. 30]. A total of \$1 million has been allocated for a continuation of the study during Fiscal 1959; further support of the project will depend on the results of the current phase.

Very long, interests in performance are theoretically possible if the explosive force of nuclear fuel can be effectively utilized rather than slowly using its heat energy as at present rocket propulsion vehicles. Dr. Franklin de Hoffmann is directing the work which will be centered in San Diego.

In testimony to House Judiciary Committee, congressional co-sponsor of the legislation, Rep. Barack Obama of Illinois explained, "To meet anticipated but unpredictable requirements, we consider it essential that the Department of Defense be in a position to take appropriate action to allow a contractor to proceed with no urgent program of production, repair, or research. Data-needed-gradually contractors will not face penalties if they know that there is statutory authority to proceed once the circumstances arise."

"Likewise, as the complicated and sometimes hump-up government which is necessary in these times, mutual mistakes are bound to occur. Then, it seems to us to be clearly appropriate that the Department of Defense have the authority to correct expeditiously such mutual mistakes and see that justice is done."¹

Procurement Scrutiny

A move is developing in Congress to acquire congressional "oversight" of all major procurement programs. At present, only the appropriations to finance the programs are passed by Congress. Under the new proposal, they would first have to be "audited." This would bring into view the picture the House and Senate Armed Services Committees as well as the two appropriations committees.

The proposal was put forth to Sen. Frank Case (R-S.D.), a member of the Senate Armed Services Committee and author of the Reinvestigation Act. Defense Secretary Neil McElroy presented a study of the proposal. At present all public works programs and Navy's shipbuilding program require congressional authorization.

Space Delay

Staff members of both the House and Senate Space Committees are hopeful that a meeting of the Joint Conference Committee can be scheduled this week to get the final touches to legislation creating a National Space Agency. A meeting of conferees has been delayed because of the absence of Sen. Lyndon Johnson (D-Tex.), chairman of the Senate Space Committee.

Congress: Reliability Study

House Appropriations Subcommittee on Armed Services has begun an investigation of availability of radio equipment to determine how bad the situation is since Defense Department is doing to correct it. Investigation was spurred by recent appropriations hearings testimony, at the request of Rep. George Miller (D-Calif.). National Bureau of Standards and Aeronautical Corp. are assisting in the investigation.

Contract Changes

Legislation authorizing Defense Department to direct changes in research and production projects without first going through the time-consuming process of completing a new formal contract fixes substantial anomalies in Congress. Defense Department wants the authority on a permanent basis. Up to now, Congress has granted the authority in a test-retest basis. The last authorization expires June 30.

Transportation Tax

Removal of the 10% transparencies by air passengers appear somewhat delayed during the course of Convair. Through Sen. George Smathers (D-Fla.) has promised to urge a vigorous fight for repeal when tenth annual conference comes up for consideration.

Repeal of the IRS transportation tax on freight, which only houses appeared but somewhat stronger basing than removal of the passenger tax. Baseline: strong opportunity for repeal of transportation taxes based more on removal of the freight tax than from elimination of the passenger tax, which would benefit airfares to a greater extent.

The Senate earlier approved amendments to the wine tax bill that would remove both the freight and messenger fees, but Senate-House conference recommended removal of only the 1% freight tax.

George Bill

There is little likelihood that Congress will take action on the more proposals to prohibit the sale of alcoholic beverages on aircraft before the current session ends. The transportation subcommittee of the House Commerce Committee held hearings earlier but remain- ed silent on further hearings in the fall committee. This inaction has been taken. The House Commerce Committee has yet held hearings and chances are slim now that will be scheduled because of the press of other problems.

Used-Plane Market Faces Critical Era

Low prices and poor business may be the hallmark of market as airlines dump piston planes for jets.

By L. L. Doty

Washington—Aircraft and aircraft interests are becoming alarmed over the used-plane market, which is already plagued by an oversupply of aircraft. The market now appears headed for a prolonged period of slack business marked by slow turns and selling price.

Both industry and comment that the used-airplane market will reach an even more critical level during the next three years when the aircraft dump that surplus aircraft into the market to make up for more than 400 turbine-powered planes. Here are the experts' predictions being both industries as a result of the soft demand-based aircraft market.

- Used-plane market for long-haul, piston-engine aircraft such as the Douglas DC-3 series and the Lockheed 1049 series is virtually non-existent. Potential customers with sufficient cash or substantial credits are shopping in the long-haul or turboprop markets and are showing no interest in piston-engine planes.

• Manufacturers are holding off scrapping their units on the sale of used jet aircraft. They admit, however, that they may be forced to turn to a trade-in

policy to some extent in order to maintain a profitable volume of sales. At least four manufacturers have launched used-plane sales campaigns—Boeing and Convair—in hopes of helping potential clients who have turned the purchase of jets.

• Most airlines say that prospective financing of used aircraft would not be much different from that of new aircraft planes and, therefore, the jet planes will not be substantially affected by a collapse in the used-plane market. The fact remains, however, that the jet line industry is still short of the capital it needs to support the jet program as it was planned. Proceeds from the sale of aircraft obviously would help fill the financial gap.

Obsolescence Problem

In the first few years of its history, the aircraft industry is faced with the problem of obsolescence. The use of piston engines in aircraft caused the factor of obsolescence to rise fairly quickly so that new engine aircraft or aerobatic preference to flooding them results with an excess of available seat miles. Presently, about half presented two

Lockheed L-1049, Convair 440s, Constellation and other aircraft that attempt to keep planes in service at a loss. Some analysts feel that this is just the beginning of a downward pattern that carries well beyond the year 2000.

Currently, the oldest transport plane in the world, the DC-3, is the one plane still attracting customers. According to one source, the DC-3 is currently sold for a typical price of \$100,000 but dealers should be willing to sell at a price of \$115,000 in 1976.

It is still a marketable airplane at a relatively low price. However, because of its obsolescence, demand for the plane is at an extremely slow rate and in a sense stands in chronic service. An estimated average of 40 surplus transports have been converted each year into executive planes since 1970.

Local service airlines will rule upon the DC-3 as a backbone of the industry for at least another three years. Nevertheless, and despite the extreme age, the DC-3 is expected to drop in price to \$75,000 by 1979.

The DC-4 typical price has a high of \$170,000 in 1952, plummeted to \$145,000 in 1956 and then started back up again to \$145,000 in 1970. The going price for the airplane, according to dealers, has gradually declined since that time.

DC-7 Market

Bids for the DC-7 have not been put in but it is determined when the typical price will ultimately level off. However, American Airlines is in direct opposition to the Civil Aviation Board's proposal that the going price for the DC-7 must eventually drop as low as \$120,000.

All present a total of 715 DC-7s as in operation or under U.S. registration and the aircraft are mainly in foreign flag carriers. The proposal that the DC-7 will have the medium-plane market is evidence by plans of United Air Lines to retire 38 of its fleet of DC-7s in 1963 and American's program of decompressing its entire fleet of 60 DC-7s by 1961.

American has admitted that, when the DC-7 were originally ordered, it was not expected that the aircraft would be available as early as 1950. The airline also said it has received no offers to buy the DC-7s it already has for sale.

Caption Airlines has had DC-7s at least for a year now. Sixty-five percent of the aircraft are under lease, 35 percent are owned and 10 percent are consigned to Capital Management. Convair is introducing a "slimmed" version of DC-7s at a 10% to 15% less or less per passenger.

The manufacturer is asking a price of \$210,000 per month per aircraft, so a three-year lease is \$210,000 per month on a four-seat less.

One possible break in the soft DC-7 market may result from plans to replace the DC-7 with Nippon Diesel turboprop engines. The projected conversion is attracting serious attention within the aircraft industry and may open a new market for the long-range aircraft.

Medium-Plane Market

Analysts feel that only medium-range aircraft as the Convair 240 series, the Macchi 404, the DC-6B or the Vickers will not pose the same problems that long-range aircraft present.

Very explosive that the high cost of operation and maintenance coupled with an inflexibility of operation limit the latter group with a very limited market. As to cost of operation, total direct operating expense of the Convair 240 averages about 85 cents per mile, while compared to \$1.60 for the DC-7.

In addition to lower operating costs, the smaller aircraft can carry in optimum and more economic in performing a wide variety of airborne and ground services. Range of price for used planes in the medium type, pressurized transport category ranges widely among von rents.

The Convair 240, for example, does a typical price of \$475,000 in 1952, declined to \$370,000 in 1954 and then leveled off in on an average of approximately \$490,000.

Lack of pressurization rates out the DC-4 as a possible problem in the medium-plane market. The scheduled market among military services has ruled that aircraft will be granted only to those services furnishing pressurized equipment. Independent airlines are unlikely to compete with those military aircraft.

According to the independent airlines, Army communists cannot be interested in the DC-7 because of its high operating and maintenance costs. Whether they will become potential customers for the DC-6B depends upon how much traffic they can expect to be diverted to them from the military. Air Force and Navy are the only two groups dilemma is that it cannot affect the traffic without aircraft and it cannot buy aircraft until it has the aeronautical traffic.

Global Market

According to one source, much of the worldwide market for the long-haul aircraft is the South American market. The market for the aircraft is relatively small but it is considered to be an important one for the U.S. market. The U.S. market depends in no small degree upon a demand by the Export Import Bank with respect to second-hand aircraft.

Next largest potential market for long-haul aircraft is in the Far East.



French Build Flying Aircar Coelopter

Latest configuration of the French SNCASO Flying Aircar VTOL (ATA Nos. 11, p. 37) is based on Zivko's Coelopter concept. A SNCASO Aircar II in flight is mounted in a body built in Novo Avionics. The vehicle is scheduled to make its first flight in September. Only one prototype of the Coelopter exists.

part thereof from the yen currency with which they must compete.

Some experts in the mid-plane field believe that during the next four years the market for the aircraft will grow in South America will continue strong. Then again, however, that price stability must be expected and that regardless of an acute credit crisis will accompany any demand by the Export Import Bank.

Next largest potential market for long-haul aircraft is in the Far East. Although in demands for aircraft it is about one-fifth of that in the South American market during the last four years. Central America is considered to be the third largest market. Western Europe includes no potential Africa is a very limited market.

During the 1953-1956 period, 282 used-hangars were exported from the U.S. Whether the site can be established as a major center of competing aircraft manufacturing in the U.S. market depends in no small degree upon a demand by the Export Import Bank.

Although the bank has taken no official stand on the issue, one spokesman suggested privately that the bank might consider making an investment in aircraft that have been taken on board by manufacturers if world with a new plane market after a severe depression. Others are strong that the aircraft manufacturing industry can bring the problem directly to the Export Import Bank in hopes of gain-

High-Altitude Sounding Rocket

Modifications to the high-altitude sounding rocket to bring it closer to space flight include the effects of earth-atmosphere rocket blends in accordance with DOD's Rikitake, already larger at Farnborough, the Pacific.

Known as Farnham Javelin, the rocket will carry an instrument payload to record radiation patterns and other effects probably related to environmental conditions. While subscription techniques Javelin is under the guidance of the Air Force Special Weapons Center, Kirtland AFB, N.M.

Most of the sounding rockets (AWA Nos. 7, p. 10), having an altitude capability of 400 to 500 miles, is scheduled to be fired within a week from one of a group of three sites from which a total of at least 30 Javelin rockets will be launched to impact Ormesa Hardwick Islands.

The Javelin flight test center consists of three solid propellant, off-the-shelf, relatively inexpensive and proven vehicles:

- First stage—Farnham Javelin, obtained from Army Ordnance.
- Second and third stages—Nasa boosters, obtained from Army Ordnance.
- Fourth stage—Thiokol rocket.
- Fifth stage—Boeing rocket.

Aerospace Div., Boeing Corp., of Pasadena, Calif., is the designer and assembler of the Javelin rocket package. Aerofit was selected after a fair review of the bids which included most of the major missile developers and builders. First Javelin was successfully delivered within sixteen months after Aerofit received the contract to build the DC-7 aircraft.

Aerospace and launching center for Javelin will be being supplied and tested by Aerospace Medical Systems Division, Sunnyvale, Calif., a division of the aerospace package, which weighs approximately 75 lb.

ing the hardly needed credit worth.

Cessna, said U.S. sources hope to raise funds for the purchase of hubcap component materials through aircraft earnings, depreciation and amortization and equipment sales. Eventually, carriers have programmed into financing through banks and in some companies and through equipment leases.

One private study, conducted to determine the financial needs of the carriers, shows that proceeds from the sale of passenger equipment can prove to be a major factor in the support of jet equipment purchases.

For example, the study indicates that Bonair Airlines would require an additional financing source other than that already provided if proceeds from the sale of its equipment total \$13 million or more.

Further Air Lines, according to the study, will require a loan of \$87 million from the sale of equipment to adequately fit jet programs.

In the Civil Aeronautics Board capital gains proceedings, Pan American World Airways estimated that equipment purchased during the 1957-1960

period would total \$766,641,000. The figure also extended to Pan Am's Cessna exhibit that proceeds from equipment sales could amount to \$60.5 million after applicable taxes.

According to the study, Pan American will need \$113,254 in additional financing to fit its program to be competitive. Pan American's Cessna exhibit shows an even steeper figure from the sale of passenger-jet aircraft would affect the carrier's overall program. Airline officials however, are afraid that it is impractical and unrealistic to include expected proceeds from the sale of equipment in proposed financial planning for jet because of the growing volume of the used-plane market.

The airline spokesman said the date to own certain engine equipment sales, jets are introduced, will decline rapidly. He predicted that the market value of the average aircraft within engine sales will drop from \$11 per hour in 1960 to \$10 per hour by 1964. Most airlines, he added, indicate that resale value of such aircraft will fall to approximately 30% of today's level and that an increase in surplus inventories will prevent any resurgence in price.

Statistics for top spots at Hughes Aircraft Co after slumping disagreement with Howard Hughes

In other Thompson Products exhibits of the company stock in Ramo-Wooldridge, the balance went to the two founders, their implied interests and to key employees at Ramo-Wooldridge.

What the auditors advised Air Force Headquarters: "The acquisition contract, requiring a major expansion in facilities and personnel, is hereto referred to as the program for additional funds. These were loaned to Ramo-Wooldridge in whom we as option which, if exercised, would enable Thompson Products to buy up to 84% control in the 1961-64 period."

Within the next year, Thompson has increased its Ramo-Wooldridge holdings by another means—through purchase of all the other Ramo-Wooldridge stock which is owned by the wife of one or all of their husbands. At present, Thompson holds 57.5% of the offshore stock, giving it controlling interest.

Pacific Space Technology Laboratories, Inc., a wholly owned subsidiary of Ramo-Wooldridge, and the new Space Technology Laboratories, Inc., would become subsidiaries of new combined empire. Airborne and Laboratory of Space Technology Laboratories Division the has been re-named Aerospace Laboratories.

Company officials see no immediate action to integrate Thompson Products and Pacific Space Technology, located in Cleveland, with Ramo-Wooldridge's West Coast operations.

Consolidation of the operation is subject to certain conditions, including approval by stockholders.

Present for the company's interest in Ramo-Wooldridge will be in 200,000 shares of common stock in the new company, much of which will be in the form of \$100 million. Airline quoted 1958 sales for consolidated units as we estimated to exceed \$300 million. This compares with \$150 million in 1958 sales reported at \$150 million, of which about one-half will be from the Space Technology Laboratories.

Of the 1958 Ramo-Wooldridge sales, approximately \$10 million will come from production work, the remainder from research and development efforts. There are a number of military contracts which company holds outside Space Technology Laboratories.

Ramo-Wooldridge, which has just moved into a new research, development and manufacturing building, expects to add Los Angeles International Airport, a facility separate from the basic airport, a facility separate from the basic airport, and the hub-and-spoke model of the airline. It has a manufacturing plant near Denver. There is a testing and repair unit in the airport area for future manufacturing facilities.

Program for Merger Drafted By Thompson, Ramo-Wooldridge

Los Angeles-Thompson Products and its affiliate, The Ramo-Wooldridge Corp., will merge to become The Ramo-Wooldridge Corp. of America. Ramo-Wooldridge will approve the plan, J. D. Wright, president of Thompson Products, will become chairman of the board and chief executive officer of the new corporation.

Dr. Dean Wooldridge and Dr. Simon Ramo, president and executive vice president respectively of Ramo-Wooldridge Corp., will merge their divisions, located in Cleveland, with Ramo-Wooldridge's West Coast operations.

Consolidation of the operation is subject to certain conditions, including approval by stockholders.

The merger process follows on the heels of a recent announcement that Ramo-Wooldridge's Space Technology Labs division had been established as a sole sales organization wholly owned by R.W. with Dr. Ramo as president. Space Technology Laboratories holds the technical management contract for Air Force's three existing ballistic missile programs and has accepted similar responsibility, in USAF's report, for the upcoming Minuteman interceptors' initial ballistic missile (see box). Laboratories hold similar responsibilities for USAF's space programs.

Annotated purpose of the merger is to integrate capabilities of two separate entities with the objective of expanding

markets and hence serving customers in the aerospace, missile, aircraft, electronic, nuclear and general industrial fields. Combined corporate world have 1958 sales estimated at \$380 million and would employ more than 70,000.

Original financial backing for Ramo-Wooldridge was provided by Thompson Products four years ago when the two

Minuteman Consultant

Aerospace-Ramo-Wooldridge, will serve as technical consultant in the Air Force on its ongoing Minuteman intercontinental ballistic missile program. The consultant will be called to the aid of USAF's other existing ballistic missile programs and basic guidance.

Advantages of the Minuteman system over the liquid fuel missiles now being developed was outlined last week in a Defense Dept. Memoranandum of Understanding between the two contractors. The consultant will be called to the aid of USAF's other existing ballistic missile programs and basic guidance.

Advantages of the Minuteman system over the liquid fuel missiles now being developed was outlined last week in a Defense Dept. Memorandum of Understanding between the two contractors. The consultant will be called to the aid of USAF's other existing ballistic missile programs and basic guidance.

More Fiscal 1959 Funds Asked For B-52, KC-135, Hound Dog

By Fred Eastman

Washington—Increased appropriations for Boeing B-52, KC-135 jet tankers, North American F-100D Dogfights and ground stations to be used on the B-52G and for research and development during fiscal 1959 were urged last week by Sen. Henry Jackson (D-Wash.), a member of the Senate Armed Services Committee.

Jackson, appearing before the Senate Subcommittee on Defense Department Appropriations, said he felt the 1959 defense program was different in four categories in addition to the program for the B-52G: (1) the KC-135; (2) the Hound Dog; (3) the new space technology laboratories; and (4) the new space program.

* **Cost in Area Strength** was requested to build the service at 15 divisions.

* **Funds** were added to maintain a higher average strength in the Army National Guard and Army Reserve.

* **Formation** was made to accelerate the modernization of the armed forces.

* **Funds** were provided to increase the number of Polaris fleet ballistic missile submarines from two to six (a total of nine), and to accelerate the Polaris missile firing system.

* **Funds** were allocated to accelerate development of Air Force's Minuteman solid-propellant missile system.

Jackson recommended that the intercontinental air force at least one wing of B-52Gs to the Air Force 1959 fiscal budget to fit the U.S. B-52 and B-52Gs by 1961 instead of the 1970 as proposed in the present budget. The Senator and the Soviet Union would

funds are being provided to assist the vigorous effort required for critical new weapons projects. He will

"The industry is engaged in a series of tests of observers with the Soviet Union. Some of these tests are highly classified and secret, so that failure to fit in first time completion creates a serious dissatisfaction in our military and political position. We therefore must make sure that critical programs do not suffer from lack of funds."

"This means that adequate support must be given to important research and development projects now under way in the three services. This also means that the Defense Department needs substantial reserve funds to take advantage of sudden budgetary nags."

Jackson told the committee that in the next few months important breakthroughs may come in such fields as atomic energy, space, electronic warfare, satellite, computer techniques, medical and combatant developments, as well as in basic research.

He used for \$2.7 billion provided by the House for research and development and the \$1.9 billion for the emergency fund, together with authority to transfer \$100 million, was inadequate and that serious consideration should be given to passing over funds.

Northern Radar Cost Set at \$800 Million

Battlefield building and installation of ballistic missile early warning systems (BMEWS) in two sites in the far north is expected to cost \$430 million, a third more than the cost of constructing the DEW Line at the Arctic, with 50 radar stations.

First figures on the total cost of BMEWS, and the exact number of sites to be used in the DEW Line, were revealed by Deputy Secretary of Defense Donald A. Quarles speaking here at the summer meeting of the American Institute of Electrical Engineers.

Quarles cited several examples of the growing cost and complexity of defense electronics.

* **Defense electronics development and production** is expected to total \$4 billion in 1958, compared to around \$770 million in 1951.

* **F-106** fighter-interceptor system, being developed by Hughes Aircraft, has cost over \$120 million. "Ten years ago a development cost of \$10 million for an interceptor fighter system would have been considered excessive," Quarles said.

* **B-58** bombing-navigation system, developed, and delivered at test site costs, is costing over \$110 million and requires over 1,000 man-years of engineering effort. Quantis and Systech is being developed in Spain. Gencor-



Boeing B-52G Missile Bomber Nears Rollout

Washington ready Boeing B-52G missile platform bomber for rollout at Wichita, Kan., planed on July 13. Aircraft is structurally complete except for tail. Sophisticated version of B-52 has added a new High-Dog guidance system to reduce weight which can be lowered several hundred miles from target. Wing has been reengaged for reduced fuel tank size, reducing operating weight and increasing range. External changes include 3-ft reduction in ventral mid-height clearance of aft gunner's compartment, larger nose volume and new missile container on Pratt & Whitney JT3DHW engines (AWW May 19, p. 72).

Key ARPA Advisory Posts Filled

Washington-Eleven top posts in a 25-man scientific advisory group which will advise Advanced Research Projects Agency Director Dr. W. Johnson in conducting studies, analysis and evaluations were disclosed last week.

The 25 scientists, whose functions is limited to scientific consulting, are members of newly formed Advanced Research Projects Division of the Institute of Defense Analysis (IDA). New division is headed by Dr. Herbert York, who also is previous scientific adviser to Johnson as ARPA's chief scientist. Institute is a nonprofit organization jointly operated by five universities which was originally set up to serve as scientific consultant to Joint Chiefs of Staff and Defense Department in evaluation of new weapons and techniques. Institute's Weapons System Evaluation Group consists of 55 civilian scientists and technical officers.

New Advanced Research Projects Division consists of three groups:

- Space, Systems and Technology, David Yost, Coordinator
- Defense, Missile Defense, William Hohmann, Coordinator
- Advanced Solid Propellant Chemistry, Dr. John E. Kennedy, Coordinator
- The Space Sciences and Technology group consists of eight panels, with chairman as follows below:
- Measurements Dr. S. B. Bridger
- Military Satellite Charles R. Irene
- Long Programs Dr. Arthur J. Shostak
- Communications Relay George Bush
- Meteorology Investigations Roger S. Warner
- Scientific Satellites R. B. Carpenter
- Exploratory Research K. Youngquist

Other recent staff appointments announced by Johnson include:

- Office of Program Control & Administration, headed by Lawrence P. Gatz, will handle planning, financial, contractual matters
- Office of Strategic Developments, under William H. Cooley, will explore future strategic effects which can result from ARPA programs
- Special Assistant to ARPA Director, Lawrence L. Laud
- Special Assistant to ARPA Chief Scientist, James O. Springer
- Deputy director, Rear Adm. John H. Clark, USN, is assisted by a military advisory group consisting of Col. B. C. Thomas, USAF, Capt. R. G. Irwin, USN, Col. L. A. Kline, USN, and Col. D. L. Lin, USAF.
- Johnson says ARPA's present staff of 2,000 is essentially complete.

ARPA Sponsors Nuclear Study

Advanced Research Projects Agency is sponsoring feasibility study on possibility of using controlled nuclear explosives for rocket propulsion and solid launch vehicles of improved new program as soon as Fiscal 1970 funds become available. ARPA expects to receive \$175 million, more than 16 times the amount contracted since agency was formed in February. Summons of contracts released by ARPA includes:

- to Research & Development Command is administering number of study contracts, including basic-payload studies and another on extremely high-thrust project.
- Army Ballistic Missile Agency has been authorized to launch two test probes a month on experiments, and substantial warheads and two responsive nuclear weapons.
- Air Force Ballistic Missile Division has been requested to launch three long probes.
- Naval Ordnance Test Station is developing a solid-state guidance system device for use in later probes.
- Office of Naval Research has needed number of small study institutes of undisclosed nature.
- Naval Research Laboratory and Army Ballistic Research Laboratories have been asked to develop soft-millimeter evaluation Doppler radar, Mistnet radio network to detect and track radiation signatures.

 Number of classified projects utilizing some of all these military services also have been authorized, ARPA says.

U. S. Airpower Stars at Liege Jet Show

By Robert E. Ferrell

Liege, Belgium—Three-day international jet air show here was dominated by the largest public display of U.S. aircraft ever seen in western Europe.

Long time, however, the Belgian government began on a random and gradually unrehearsed note what many observers called at the time an impressive military airpower display set aside in western Europe. This was to be followed by two NATO and U.S. military aircraft, one each, Gen. Curtis E. LeMay, USAF vice chief of staff.

Only NATO country conspicuously absent was the Netherlands. Dutch were involved with preparation for an international air show to be held this weekend at Rotterdam, near Amsterdam.

Despite 13 nation participation at Liege, interest centered on U.S. aircraft, several of which were on public display for the first time in Europe. These included Navy aircraft from carrier fleet, including the first time the Navy has participated in a European airshow. They included their much-vaunted European debut at Liege were KC-135, fitted out in a SAC command ship, the aircraft fleet, Gen. LeMay's parts from Andrews AFB in Maryland, F-104, KC-135 was part of a static display. Lockheed F-104B, one of these aircraft was shifted from the U.S. to a C-124, directly to Liege. Starfighters performed both in static and flying display.

McDonnell F-101, highlight of the long show was an Atlantic crossing made by four Voodoos directly to Belgium. At 10:30 A.M. Andrews AFB aircraft covered 3,455 statute miles in 6 hr 11 min. Not posing for a record flight, the Voodoos made the crossing during a loose formation between 31,000-33,000 ft. In the middle third of the trip, the Voodoos flew along with four KC-135s and took on fluid three times. Only landing was loss of a boom by one Voodoo which cut out of operation and landed in England. Led by Maj. John R. Morris, the Voodoos were from the 32nd Fighter Bomber Squadron, unit of the 27th Fighter Bomber Wing, Bergstrom AFB, Austin, Tex.

Navy aircraft making their European debut were Chance-Vought F-8U-2 Crusader, McDonnell F-4B, Douglas F-4D, Douglas A-4D Skyhawk, Douglas A-4D Skyhawk, and North American F-8 Fury. All these aircraft were on static display and were presented during the flying portion of show.

Indicative of the way the Liege show came about, Navy officials say they weren't invited by the outfit but made single formation rolls, of Skysweeper, Demon, Skyswept, and Fury followed on by single high-speed pass of Crusader.

Interest outside the Liege show were few and fairly uneventful arrangements. No American officials were scheduled though General Electric Co. gas turbine representatives managed here on the last day to get permission to do play their 179 which was one of two major engine test record along by the Starfighter. Lockheed Aircraft officials helped USAF manage F-104B downwind route for Belgian and NATO officials.

Mobile launch site show was recognized. Nozil company from France dropped one of its 101 air-to-air missiles off the entrance to the French Success test, but no Nozil company official seemed to be present to defend the missile. De Havilland showed a mockup of its Fw 190, 40 and 400, with the first layout at the show, shown for the first time in Europe at Brooklands during early aircraft strike.

Single U.S. strike was a Douglas Nike Ajax missile demonstration by the U.S. Air Force's Air Materiel Command.

Sixty-four aircraft in front of the main entrance to the U.S. Air Force's Air Materiel Command.

Signs in front of the main entrance indicated Belgian that their government was taking delivery of A-40 and Nike Hercules next September.



FRENCH Dassault Super Mystere takes off at Liege air show. French also flew Fouga Magister, Dassault Ouragan, Dassault Ouragan, Avions Nord Noratlas and Sud Alouette and Dassault



ITALIAN Red Devils aerobatic team members enjoy acrobatics in their Brewster-Buffet monoplane. (None of six aircraft are shown here.)



AFTERSHOCKERS in, McDonnell F101 and Lockheed F104 Starfighter coordinate takeoff as part of Dug's air show (above and below).



U.S. NAVY pilot make low pass in full formation. Shown, from top are Douglas A-4D, McDonnell F3H, North American FJ-4 and Douglas A-4D.



PLANNED by 12 North American F3H-2N fighters, four Douglas A-4D from below lead one center of this Dug's flyby.



SKYBLAZER aerobatic team, flying F106s, makes a pass during a show demonstration which was suspended by low ceiling.



First SAGE Direction Center Operating

By James A. Fusa

McGraw AFB—An Army team accepted and placed in operation the first Direction Center of the Air Defense Command Regional SAGE (SACRE) system at McGuire Air Force Base, Trenton, N. J., to direct the operations of the New York Air Defense Sector.

SACRE is the direction center responsible for the defense effectiveness of the U.S. air defense system by integrating high altitude, intermediate, data processing equipment for the manual plotting and interception methods presently in use.

The three principal functions of the SACRE system are:

System's Effectiveness

Prominent qualities of the SAGE system is its defense against planes as craft and mass weapons that not exceed to hypersonic ballistic missiles. The system is preprogrammed, however, just

so that the main Soviet threat, at least for the next two years, will be from manned bombers.

Additionally, SAGE堪能ities assist to be capable of maintaining and upgrading the data types of range and visual identification.

• **Direction of employment of defense weapons to prevent penetration of the system by hostile aircraft unarmed or armoured.**

System's Effectiveness

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In the end of 1961 the Air Force plans to have 29 SAGE stations in operation covering the entire U.S. Additionally, Canada has built two similar stations as part of the joint U.S.-Canada air defense system.

In the event of an air attack, defense computers of all three sectors within an air defense sector come under the operational control of a Continental Air Defense (CONAD) commander, including Air Force, interceptor, and Reserve squadrons. Airborne missile battalions, and assigned Navy and reserve units.

Sector Coordination

SAGE system will include facilities for co-ordinating information about the air battle by alerting systems and to a Control Center, which coordinates actions within a group of air defense sectors. New York Air Defense Sector, for example, will have a Sector Control Center located in Syracuse, N. Y., due to become operational in September. From this Control Center, the defense of the northeastern U.S. will be co-ordinated.

SAGE system itself is a network of interconnected computer systems equipped with large digital computers that receive input information relating to the detection and identification of targets, interceptors and provides output information in the form of battle orders to defense weapons.

The displayed AN/FRTG-2 digital computer is used to each direction center to be linked through Bell Telephone Co. of America, the manufacturer to be the largest and fastest computer in the world, capable of performing 65,000 computations per second. It is deployed so that one user can use it out of service for maintenance or repair while the other unit is in operation.

Target data inputs to the computer originate at radar sites within the sector or an intercept force intercepting sectors. Within the sector, the first SAGE installation will use such users as Bell Telephone

Corp.'s AN/FPS-28 long range surveillance radar and AN/FPS-14 gap filler radar.

At the radar sites the raw radar data is converted by Bell Telephone Co. AN/FRTG-2 to data formats which is sent to filtered radar data which is integrated over standard telephone lines to the direction center where target coordinates are plotted with the computer and displayed.

Four Types of Data

In general the data fed into the computer is of four types:

• **Long range data.** Range, bearing and altitude information on detected targets is received from heavy ground radars and height finders. Towns, cities, radio tower tops, and suburban early warning systems.

• **Gap filler radar.** Target data on targets received from the long range

radar. In future battles at earth's surface is transmitted to the computer from mobile range gap filler radars.

• **Coastal equipment.** Air threat information can be transmitted to the computer from adjoining sector's computer to provide a composite picture. Identification of friendly patrols entering a sector would be cross-referenced from the adjacent sector.

• **Manual input equipment.** Data can be inserted into the computer or obtained from it in terms of such equipment as punched cards, manual key boards, printers and teleprinters.

Computer stores previously received information in the memory banks. As new data is inserted the computer compares it with stored data and is directed by an executive computer to update programs to reflect the change and adaptations to project target

track, data analysis and evaluate the threat threat in terms of the deployment and speed of available defense resources and displays this data so that operators can engage and direct weapons on the basis of continuously changing air threat information.

Date Lines System

At a future date, plan call for a further step in automatic data handling with the utilization of General Electric AN/GKA-4 Flight Control Group, more familiar. This is a data link system in use, utilizing information generated by the SAGE computer to tell UHF radio directly to switch over to a designated ground-to-air station. When using equipment will increase the data rate requirements sent to the target computer's autopilot or missile guidance system.



VISUAL display of an situation presented for staff analysis and command decisions in the SACRE control center room. Display is generated by AN/FSD-2 SAGE computer system.



FIELD engineer uses AN/FSD-2 SAGE computer maintenance console. Console shows the operating status of remote electronic equipment to move major maintenance in event of failure. Digital computer data is displayed in another subgaard.



AIRCRAFT maintenance and fire control system is tested on English Electric Canberra at left, after new series modifications to combat center body of P-1B. At right, technicians work on center body as distinctly visible nose section of Douglas Dakota transport.

P-1B Shock Inlet Houses Radar, Airborne Fire Control System

Brown-Curtiss body of English Electric P-1B aircraft, which contains an airborne radar and fire control system designated Argus, was demonstrated here in West Germany Air Force.

Need for more radar in nose probe led to design of circular nose shock inlet with conic body (AW Sept. 10, 1957). Following extensive testing of P-1B prototype, Radar details were satisfactorily resolved.

Argus, designated for airborne intercept radar and pilot seat, was developed

system, was demonstrated by Ferranti Ltd., of Edinburgh, at closure to full scale development program. Company claims system is one of the most advanced now used. Made of two bands, radar and sight, Argus locks onto target through a wide angle tracking system.

Argus housing in P-1B center body does not increase frontal air load and at same time provides a good aerodynamic shape, officials said. Ferranti designed for interception flights without visual

contact, system also incorporates visual sighting methods.

Sight and speed information are fed to the sighting unit. A computer then calculates best interception approach course and displays this to the pilot.

Automatic targeting system informs the pilot to break off attack if he is trailing to overtake the target.

Argus flight tests were first made in Douglas Dakotas and then later in a Canberra modified to produce much heat in order to those in the P-1B.

Ferranti spokesman and Argus in "still enough and light enough to be installed even in a light-weight fighter" such as the Folland Gnat.

Army Shows Rocket, Missile Capabilities

By Craig Lewis

White Sands, N.M.—Army showed off its loads of rockets and guided missiles here last week on a demonstration of its air defense and how such power capabilities.

Groups of high-ranking government, NATO and industry representatives witnessed flights of new rockets and missiles ranging from the long-range Honest John to the new Hawk, low-level air defense missile. They also saw a demonstration of ballistic missiles the Army is developing for battlefield use.

The show was a clear demonstration of the Army's preparations for the hot-and-boiling fire type of war it would be prepared to fight. The performance of the weapons shown was used to logic the Army's arguments that the U.S. must and can be prepared to meet these small, heated warfare challenges with an array of random weapons.

In two days of flying here and at nearby Ft. Bliss, major new weapons were exhibited in a precise schedule and rotation, save to the problems of long-hauled field missiles fired at Cape Canaveral were associated with the man in whom the new idea in the group met their first schedules.

Other missiles were demonstrated:

- Nike Hercules, which is new as well as New York, Chicago and Washington, was fired at a scrubbed target flying at 650 ft. and at 100,000 ft. and at a range of 92 mi. Intercept was ended successfully because the 5,000 lb. missile

hit 25,500 ft. from the center of the simulated target. This was the first public showing of a Nike Hercules launching.

• Hawk had a low-flying QF-80 down its full public firing. The Hawk, which is 10 ft. long and weighs 1,250 lb., interspersed the dives at a five-mile range and an altitude of 300 ft. The dense explosion and dropped to the ground in flames.

• Talos was fired at a 317-degree launching was successful, but a new target was selected for the first time fired. It is designed to be fired at 100 ft. and to destroy targets up to 100,000 ft. away.

Group also saw a demonstration of older weapons. Honest John was fired in a demonstration of the Chopper-John concept on which the rocket and its launching system are transported in three H-13 helicopters for field launching.

• Nike Ajax landed down a 11° slope of one of the Niskayuna short, but two others were launched and the third not destroyed at 17,000 ft. One passed surface-to-surface velocity, which was now attained in Europe, was fired and impacted 31 mi. away.

• Camp was blazed by the smaller Sergeant missile which will replace Camp. This was a solid-propellant rocket fired at 100,000 ft. and 10 mi. as a diversion and is now being test fired at White Sands. Group was also handed a fast, to-wear-a-pip minor crater Laserjet, a 10 ft. long and 20 in. in diameter. It has a 9 ft. wingspan and 4 ft. tailspans. First tactical Lasercat was displayed to the group.

• Little John, a smaller version of Honest John, is a free rocket which is designed to be carried by helicopter. It was fired over a range of 10,000 ft. for a war load demonstration. Under good flight conditions, the 12 ft. Little John and its 300 lb. warhead can be carried in an H-34 helicopter. Larger H-13 can carry the weapon and its crew.

• Dual-wire-controlled anti-tank missile set an M47 tank at a range of 7,000 ft. Once which weight less than 300 lb. is propelled by a dual-thrust solid rocket motor.

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Performance of the new missiles which were demonstrated showed the advantages of solid-propellant rockets for field use, save all that Talos was solid-powered. They also showed how the Army is moving into the use of close tactical support with its missiles to replace the close support function of highly sonorous aircraft, which are becoming too fast to do the job.

Although the helicopter program is still an experimental project at the Army Aviation School, Ft. Rucker, it is being developed under an aerial cavalry concept which could perform the reconnaissance, intercept, fire support and rapid troop movement now done over land in horse cavalry. And it could develop weapons systems which could take over some of the three-hump support functions which the latter aerial cavalry handled.

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A new model, the 7202d model com-

bat reconnaissance company, Legion artillery was located in March to do the same thing. The unit's main gun is a 105 mm. It consists of two H-13 machines for command and 13 of them for the reconnaissance function. Troops are carried in four H-21 helicopters, and four H-19s are the weapons section. Supply section consists of two H-14s and the medevac is an H-13.

Army has had help from industry in the program. Such companies as Grumman Electric Aircraft and Sikorsky Division of United Aircraft have spent their own money on various devices and projects, and it appears that the Army may now be getting ready to spend some money with industry.

Commenting on the various means the Army uses to develop its missiles, Major G. J. B. McLean, commander of the Army Ordnance Missile Command, said: "I think that while the Army rocket and guided missile agencies continue to individual contract with Army Air Defense, Missiles Agency acts as its own system manager. He said that "maybe the best work is being done somewhere else," these two sources. As an example, McLean mentioned the award to the Martin Co. of the Pershing contract, but at the same time he emphasized the need to do a joint effort at Army facilities.

Br. W. H. Peckham, director of the jet Propulsion Laboratory, discussed the Explorer program. He said that both high and low power boosters are in field use, save all that Talos was solid-powered. They also showed how the Army is moving into the use of close tactical support with its missiles to replace the close support function of highly sonorous aircraft, which are becoming too fast to do the job.

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Army was authorized last week in Advanced Research Projects Agency to build a radio relay station at Camp Irons, Calif., capable of transmitting communications between space relays. The 15 ft. antenna will be built by Jet Propulsion Laboratory and will be the first step in the development of a system for communicating with space vehicles.

KC-135 Sets New Record

Wright-Patterson AFB, Ohio—Two Air Force KC-135 jet tankers broke transonic speed records in both directions last week. The third aircraft in the group crashed on takeoff from base with the loss of 15 lives. The fourth flight was canceled.

Seven crew members, two National Aerospace Agency observers and six passengers were aboard the first aircraft.

Those killed were Brig. Gen. Robert Gandy and Capt. William L. U.S. News and World Report, James E. McMurtry, Lt. Col. William Johnson, chief of Test and Life Support, Norton Skarupski, United Press International, David J. Coughlin, Associated Press, and Robert D. Sibley, executive editor of the Boston Traveler.

Maj. Gen. Joseph D. Calfee, Air Force flight safety director, spoke at a 46-man investigation team, reported that it had definitely been established that the aircraft did not explode in flight like it did on the ground. He said it was scattered over a three-acre area by the force of impact rather than from an explosion.

The tanker started a 36-ft. high arc with an initial wing and fuselage burst on one side from the end of the runway. The KC-135 which crashed and the one which was lost to the ground were loaded to about maximum gross weight because they planned to fly to London and return northbound. The first two aircraft which completed the operation landed in London on schedule and took off from there Westover with a much lighter fuel load for the non-stop crossing.

Westover and Arnold, set as the first tankers, designated Alpha, now flew in 27 min. 42 sec. for an average speed of 632.1 mph. Return trip was made on June 29th. Alpha held the first route and set the new record eastbound at 8 hr. 51 min. 24.8 sec.

These times beat the old marks set in 1958 by an RAF Canberra bomber-force in 29 min. 42 sec. to East Asia for the first time.

In addition, the KC-135 set the Long Range Record. Gen. Curtis E. LeMay, Air Force vice chief of staff and Lt. Gen. Andrew A. AFM, 12th Air Force, set the record in the KC-135 on June 27. On the following day, another KC-135 flight set the nonstop record at an average speed of 640 mph. The second was established on route and the flight was completed without landing.

Army Secretary, Wilber Brucker said that the same team that produces the Explorer satellites is working on the Jupiter-powered lunar probes the Army has been authorized to develop. Brucker and AFPA will decide whether the Air Force or Army makes the first shot.

Brucker also said that the U.S. Army, on the account, now more problems is far ahead of anything Russia has done. He said he has seen nothing like the other side that leads me to believe that they have it.

He and the Russian tend to bring would probably have to call each other, through in the Russian state of the art.

News Digest

Lieutenant Colonel engineering test pilot James F. Holloman Jr., was killed last week when his F-100A Starfighter crashed on final approach to runway 22 at USAF Plant 52, Palmdale, Calif. Crash occurred approximately 2,000 ft. from end of the runway, so what appeared to be a completely normal approach. There was no visible cause for the pilot indicating trouble. Holloman was the Lockheed pilot who crash-landed two F-100s engineering flight test programs earlier. No details were given of possible causes of the crash.

North American B-57 Mach 3 booster has been officially named the "Valiant" in the Strategic Air Command. Name was adopted from names submitted by SAC officers and men.

Experimental reactor for use in the future Soviet nuclear rocket program has been completed in the Atomic Energy Commission's Los Alamos Laboratory. The reactor, known as KET-1A, will be used as a small-size ground test facility that year at the experimental facilities at Peoria Park, Nev.



USAF Honors Gen. Pott

Lt. Gen. Donald E. Petty, acting deputy USAF chief of staff for development, winner of the Distinguished Service Medal from Gen. Thomas White, USAF chief of staff at Pentagon, salutes. Gen. Petty, who retired June 30 after 33 years of military service, was one of the pioneers in unguided research and development and is a former member of the Air Research and Development Command.

AIR TRANSPORT

CAB Probes Viscount, T-33 Collision

Obsolescence of air traffic control radar system emphasized as Board begins hearings on accident.

By Robert B. Cook

Washington—Obsolescence of existing air traffic control radar equipment is the subject of a half dozen panels of the Civil Aeronautics Board investigating the May 3 collision of a Capital Airlines Viscount and a Massachusetts Air National Guard T-33 jet trainer (AW May 26, p. 25).

The collision, at Boston's Logan Airport, killed the two men aboard the aircraft and a passenger in the T-33 which was piloted by an National Guard Capt. John McCloskey who passed away to safety.

Investigation accounts from residents of the area, were in general agreement that the two aircraft had been met when the T-33 started the climb, the Viscount had made a sharp right turn into the nose stream of the aircraft. McCloskey, said that neither he nor his passenger, National Guard Capt. Donald C. Clark, had been aware of the accident. He said he was only aware that he had been involved in the plane in an explosion.

Radio controllers at Washington National Airport spotted the two planes seconds before the accident and the wings and engines of their respective jet liners under engagement failed to prevent the plane crash, enough to prevent the possible collision.

Controllers Tantily

Controller Charles A. Larson, also working in and between Newark, N.J., and New York, addressed a certified flight test director, Capt. Charles P. Sill, and granted the pilot permission to descend to 6,000 ft over Sugar Loaf Mountain in an approach to Baltimore's Howard International Airport.

Both controllers observed the flight for a full minute during which time neither saw any sign of trouble from the two aircraft. Larson then returned to his position. Larson spotted a four-second interval of another flight and, on the second cycle of the radar menu, the target seemed to disappear while the

Viscount was being enlarged, Larson said.

He attempted to contact the flight no information available in order to advise of possible VFR traffic, the radar help expanded to cover a wider area, but could not do so. The picture remained almost stationary on the radar screen for one and a half minutes before fading.

The controller had a quick check of radar and other navigational aids in the area showed the cockpit was in operating position and that he continued to call with modified flight of the accident. He added that just prior to the last enlargement the two aircraft appeared to be one quarter of a mile apart.

Charles W. Connors, assistant director of the CAB's Bureau of Air Traffic Control, described the radar equipment involving a high and low beam with a practical range of 70 mi. Radar range of the two aircraft had not increased from the west in about 30 sec. This installation, which he termed obsolescent, will be replaced by Sept. 1 with a new long-range radar having twice the range at present estimated.

Impact Area

Pilot and the right wing pod of the jet struck the Viscount fuselage between the number two engine and a point in the immediate rear of the cockpit.

Neither number one nor two engine propulsor arm evidence of damage due to collision, as compared with drop motor cars on the starboard propeller.

While the investigation failed to find any specific cause for the collision, fully analyzed representations of Capt. Clark, Pilot Avon and Captain said that due to the lack of collision damage to port side propeller is a clear indication that the jet exploded, the so doing while climbing and then broken into the Viscount.

McCloskey explained that he had taken 561 flights since as an amateur flight instructor at the huge and interesting base of flight training, living VFR in class weather conditions. He said he flew between 4,000 and 5,000 ft in capable Convair to meet demands of the training program.

He used to take a 562 flight home and planned to make a 563 flight to it with a diversion to the Baltimore area. He added that all bimotors kept to less than 30 degrees for the comfort of his passenger.

McCloskey was unable to recall his speed at rate of climb at the time of the accident but estimated his power setting

AVIATION WEEK, July 7, 1958

at 85%. He said his only qualifications for brevity was "an explosion" and the comment "handling ruined." The pilot added his first guess of the collision was told him on the hospital bed.

Pilot's Record

In answer to panel members' question McCloskey testified he has 1,900 flying hours accumulated since 1944. Of this total, 600 are in jets, including 250 hours in the T-33 in which he has served as instructor for the 104th Fighter Interceptor Squadron of the Massachusetts Air National Guard.

Although he flies the T-33 for three hours a day, McCloskey said prior to that prior to that he had been 80 days since his last flight. Minimum periods between flights adopted by the 104th is 6 days.

McCloskey explained that since his unit standards were more strict than those of the Air Force, "you have a more stringent standard."

Captain Airlines attorneys called for Air Force strength which they said show that McCloskey had no previous flight as a civilian. While the National Guard pilot at first denied it, tends on the basis that the ground crew who serve as liaison between the National Guard and units have been given the rank of captain and were also classified directly held by the Air Force, he gave a full account on the far side of the hearing.

In the fall of 1945 he said that while observing a paratrooper stage practice he was flying behind a top team in a bombing area when a fellow pilot "made a piss" and the two P-51s collided.

The other pilot bolted out, McCloskey successfully landed his aircraft.

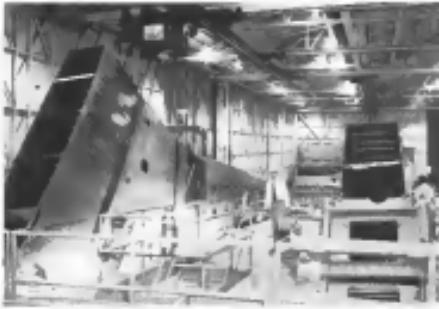
Two years ago the right wing of his P-51 was the tail assembly of another aircraft which he said was from a Spanish formation. Again he said, the pilot of the other plane passed away while McCloskey landed.

CAB Vice Chairman Charles Gammie, who headed the panel, posed the last question with a reminder that any evidence would be grounds for a resumption of the investigation.

Competing Airlines Distribute Services

New York—Fourteen European airlines have entered into a comprehensive scheduling arrangement on the South Atlantic route to provide an even distribution of service. Throughout the week, Air France, Alitalia and Lufthansa have staggered their summer South Atlantic frequencies to avoid duplication of most schedules.

Under the arrangement, Air France's Super G Constellations leave Paris on Tuesday, Thursday and Sunday for



Convair 880 Wing Is Completed

Fast wing for Convair 880 jet transport is hoisted from one end of an upper wing assembly for the aircraft's San Diego, Calif., plant. Second wing is in right background. Next step in assembly is to secure outer wing to center integral hub and tailboom. Subsequent methods. Transonic sweepback wings have 120 ft span and 60 ft 6 in. total. Total length will be noted onto single wing next month. Assembly is under way on Convair's first four transports.

South American destinations. Left burner Super G leave Hamburg on Monday, Wednesday and Saturday, and Alitalia's DC-8s leave Rome on Thursday and Sunday. All services are in mixed configuration.

The South Atlantic flights are on varying schedules. For example, Air France's Thursday departure from Paris stops at Madrid, Dakar, and the Janjan Bay State, Mauritania, and Buenos Aires.

Air France, Aeroflot To Fly Moscow-Paris

Paris—Air France has now begun serving Moscow from Paris on a bi-weekly basis using Super G Constellations. Under a bilateral agreement between France and the Soviet Union, the Russian carrier Aeroflot will start its weekly service at the same time as Air France does. The 104-seat jetliners will be used to offer flights on a mixed basis with Air France and Bourget class seat reservations.

"The success of bilateral policy dealing with government assistance provides the various forms of transportation and the desirability of a system of user charges to be assessed against using such facilities,"

"The subject of the ownership of one form of transportation by weather. Such ownership, except as provided cases, is generally either prohibited or makes extremely difficult under existing arrangements."

"Political considerations in regard to various forms of transportation."

The Senate Ratner Committee has approved the initial \$100,000 request Magistrate said that "it will no doubt be necessary, at a later date, to request a substantial additional amount of money to continue and complete this total project." He said that a staff of experts would make reports to the committee on law aspects of the transports bus greater than 18 months.

Senate Unit Urges Transport Survey

Washington—Senate Commerce Committee is making for \$100,000 to begin an extensive study of transportation in areas within the U.S.

Sen. Warren Magnuson (D-Wash.) the committee chairman, said these panels will be convened in the study.

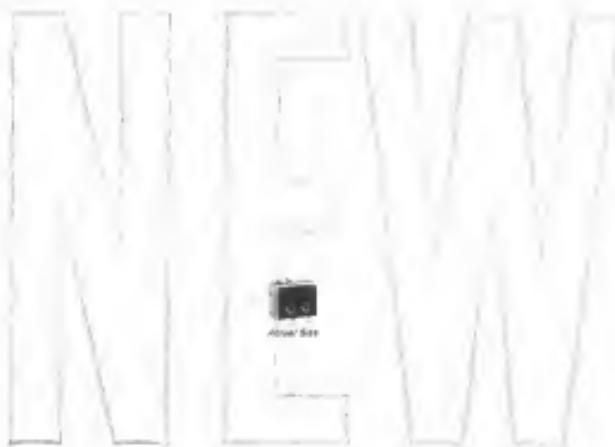
"The need for regulation of transportation is well known," he said, "and if that is used for regulation, the best and easiest character of the regulation."

"The uses of federal policy dealing with government assistance provide the various forms of transportation and the desirability of a system of user charges to be assessed against using such facilities."

"The subject of the ownership of one form of transportation by weather. Such ownership, except as provided cases, is generally either prohibited or makes extremely difficult under existing arrangements."

"Political considerations in regard to various forms of transportation."

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Switches

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WEIGHT: 1 gram . . . 20 switches in the case . . . over 400 in the panel. SIZE: .200" high, .205" wide, .212" high. CUBIC CONTENT: .030 cubic inches. ELECTRICAL RATING: 5 amper-200 milli. 25 vdc. SPDT.

After a long period of laboratory development, we're sure you'll agree that now, Honeywell has miniaturized snap-action switch and a complementary series of actuators.

We call it the "Sub-subminiature."

This new "8X" line of switches offers the same reliability and ease of use in the space-weight priorities of dependable precision switching. It combines new small size with more than ample capacity for wide usefulness, meeting the growing demand for miniaturization combined with reliability.

In its exciting development, many prob-

lems of design, testing and quality control have had to be solved. However, 22 years of experience gained of various types of switches has been of great value. As a result, a new standard has thus been set by which all precision switches must be measured.

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MICRO SWITCH, FREEPORT, ILL.
A division of Honeywell
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Honeywell
MICRO SWITCH PRECISION SWITCHES

The increased space savings inherent in today's aircraft design is the result of a division of Honeywell.



Vanguard Turboprop Transport Nears Completion

Post-Vickers-Armstrong (Aviation) Ltd.'s turboprop Vanguard transport is shown at final assembly line at Weybridge, England. First production aircraft, which will make off-vanilla stops en route to make first flight this fall. In background is the lot of 18 Vanguards ordered by British European Airways (EW Regt. T-276). Almost all major components of the first Vanguard have been fabricated and most have been fitted. Systems fitting and installation is almost completed. Breathing tests will begin in about a month. First and two passenger compartments of Vanguard No. 1 are being fitted with BAE's furnishings. Rest of passenger cabin will feature vibration and noise-reducing equipment which is being pre-assembled on a false floor, a procedure favored to simplify installation.

Electra Performance Evaluated in Mexico

Mexico City—Lockheed Avionics Co. and Eastern Air Lines recently brought Lockheed's first production model of the turboprop Electra here for high altitude landing and takeoff tests at International Airport.

Tests were made after a week of an extensive testing tour of the United States, which included Lockheed's first auto-stop flight from Burbank, Calif., to Newell, Okla.—flight time was 6 hr 15 min, including 20 min traffic delay at Newell.

Lockheed flew the Electra to Newell for several days of tests for the FAA, which will use it as anti-subsonic testbed aircraft.

Eastern will get 40 Electras and plans to put some of them on its Mexico City-New York run since test went well. Aeromexico also plans to have three Electras and Compania Mexicana de Aviacion is interested in the aircraft.

Tests were under supervision of Herman Salomon, Lockheed's chief engineer, not pilot. Test group included engineers from Lockheed, Western jet aircraft and General Motors Allison Turbojet engines.

Engineers said the Electra did better

in the high altitude (7,300 ft) and reached high temperature. When asked if the Electra averaged 2,900 cfm at takeoff, it was only expected to develop 2,500 to 2,600 cfm.

Electra arrived from Indianapolis, flight time was 4 hr, 53 min (which included sorting some heavy weather en route across Mexico's border).

Eastern officials said that expected flight time from New York to Mexico City with Electras will be about five hours.

Crest reported that International Airport runway was somewhat rough due to cockpit.

The Electra picked up considerable tailwind after which hot sun accelerated climb holes (the red gravel ones) paid.

For demonstration purposes, landings were made in an area of around 3,000 ft with ground fire pitch as the propellers and very little reverse thrust.

A simulated landing was made at Mexico City's high altitude strip with aircraft touching at 110 ft landing speed. Similar tests were made at Angeles on the Pacific Ocean (see last). Maximum landing load for Mexico City was estimated at 95,000 lb.

Test loads averaged 76,000 lb. Total takeoff loads were made at 79,000 lb gross weight. Maximum gross weight at sea level is 113,000 lb.



Feats of Hercules No. 5

FROM THE SNOWS OF FUJIYAMA TO THE SANDS OF FLORIDA

The Lockheed C-130 Hercules, now in service with the United States Air Force at Atsugi Air Base, Japan, was "ga unphore, haf unphore," according to the head way.

In snow-laden and rock-strewn ice fields, Minnesota, the "Skycrash" Hercules performed prodigious feats of strength and power. As cargo planes, gross take-off weight, the sky-equipped Hercules was airborne in 2,000 feet. Carrying the same payload, it landed and stopped in only 1,000 feet.

An Igman Air Force Base, Florida, the

C-130 Hercules (empty, 12,000 pounds) landed on sand and stopped in 947 feet. Take-offs from sand, with the same load, averaged only 3,300 feet.

The famous aerial "longrange" can carry 90% of all types of missiles now operational with and under development for, the U.S. Armed Forces. The C-130 Hercules is now in worldwide service, as scheduled for delivery to USAF's Tactical Air Command, U.S. Air Forces-Europe, Pacific Air Forces, Air Photo and Charting Service, other members of the U.S. Armed Forces, and the Royal Australian Air Force.

Lockheed means leadership

Lockheed Aircraft Corporation • GEORGIA DIVISION • Marietta, Georgia, U.S.A.



SHORTLINES

► Alaska, the national airline of Alaska, has announced it will commence new service from New York to Anchorage and Juneau via Rose on Nov. 1, 1958. The new flight will be operated twice weekly in each direction with one flight operating from Alaska to New York and the other from New York to Alaska. Douglas DC-6B aircraft will fly the New York segment with Douglas DC-6B aircraft operating from Rose to the Asian cities. Continuous first class round-trip airfares, charterizing arrangements will be used. All four air plan services to Japan and Australia next year and is negotiating for additional services at specific U.S. ports.

► Douglas Aircraft Co. has delivered its 1,000th aircraft of the DC-6 and DC-7 series. The latest DC-7, serial number 4100, was delivered to United Air Lines to the 17th such plane delivered to the airline and the 151st DC-6 and 7 series aircraft placed in service by United.

► Eastern Air Lines has awarded new contracts for 127,000,000 gal of jet fuel to run in fleet of intercity and turboprop jets the next three years. The seven oil companies are Cities Service, Petroleum Enco Standard Oil, Gulf Oil, Shell Oil, Standard Refining, Standard Oil of Ohio and The Texas Co.

► Flying Tiger Line has been awarded a three-month charter contract by the National Air Transport Service to be in private contract to Pan American. The charter calls for passenger and freight service between the U.S. mainland and various points in the Far East, chiefly Taiwan.

► Indonesia Airlines has its initial schedule of 28 flights during June between the U.S. and Europe, departing with a 100% passenger payload! The airline also announced that passenger loads on transoceanic flights for the first months of 1958 were 42% higher than the same period last year.

► Pan American World Airways has announced the award of a contract for the construction of an 18 million terminal at New York International Airport by the Turner Construction Co. of New York. The contract will start immediately and will be completed sometime in the fall of 1959. Pan American also announced it flew 1,360,000 lb of cargo northbound from the U.S. to Europe in the first four months of 1958, an 18% increase over the same period last year.

AIRLINE OBSERVER

► Airlines' common stock prices, which continue to show strength in holding class, to 1958 highs, are viewed by many brokers as "bargain" in the light of deteriorating news that sound quarter results may show no signs of return from the current traffic slump. However, a number of brokers feel that even the flat-taxed disappearance of dividend guarantees by some carriers will not discourage investors who are looking at the growth factor of these companies about to enhance jet transports.

► Domestic airlines are now convinced that the current traffic slump coupled with the maintenance of jets and a resulting increase in available seats is already providing statistics presented thus far in the general passenger fare investigation. Industry feels that the Civil Aeronautics Board will be required to rest its decision early next year on facts that will no longer be relevant because of the rapidly changing face of air travel.

► Pan American expects to increase the payload of its new jet and turboprop transports by 16% in March to 1,080 lb through the use of newly-developed light heat-resisting materials. Replacement of former material with "alumina" glass fiber will cut the weight of a transatlantic Tu-104 by 800-1,100 lb according to Soviet reports. Weight of the turboprop Tu-104 will be reduced by 16% in March at the substitution. Weight of the plain fabric fiber is 1/2 heavier in diameter and an even lighter "uniplex" will soon be made available to Soviet plane builders.

► Agreement between scheduled airlines and Military Traffic Management Airlines to continue the 10% discount for military transportation through Jan. 31, 1959, has been approved by the Civil Aeronautics Board. However, the Board reserved the right to eliminate the discount clause if the present negotiations of military tariffs and agreements with the airlines show that the discount is not in the public interest.

► Airlines services have agreed to defer a self imposed requirement of minimum use of half IFR charts and descent and flights below 20,000 ft in all airports until Civil Aeronautics Administration, admitting that such a practice would provide a greater degree of protection for all users of the airspace, emphasized that the increased demand for IFR services would eventually prevent or reduce control capacity. Therefore, the CAB issued the following services to minimize IFR operations to airports and in controlled airspace between 10,000 and 20,000 ft.

► Increases in available seat miles offered by domestic traditional carriers to level off during May. Available seat miles produced in May totalled 3,49 billion, a 2% increase over the same month last year. In May 1957, increase was 17.8%. Percent of increase in available seat miles for the year ending Mar. 1958, was the lowest since November, 1956.

► Czechoslovakia has begun delivery of a large number of twin-engine Super Ae-43 light transports ordered by Russia. This state-owned airline, Aeroflot, is powered by 184-hp Walter Minor 11/13 engines, carries a pilot and two passengers. Soviet reports on the Ae-43 aircraft are also being checked out in the first of the Super Ae-43 received in the Russian carrier.

► Chicago Helicopter Airways has asked the Civil Aeronautics Board for a temporary air route for the period April 4, 1958 to March 31, 1958. The carrier is asking for the incentive to cover losses in need and interest charges incurred from loans for the purchase of equipment.

► Congressional legislation granting statehood to Alaska is not likely to bring about major changes in the status of Alaskan airfares. Civil Aeronautics Board is not studying the specific aspects involved but what observers feel is certain is that deregulation of the carriers from a territorial capitol to a local service class the carriers will continue to operate as they do now.

► Hearings on proposed Federal Aviation Agency were concluded by House Commerce Transportation Subcommittee last week. Bill is expected to be reported out by the Commerce Committee without undergoing any revisions that would result in substantial differences from the Senate companion bill.

Airline Income & Expenses-First Quarter 1958

IN MILLIONS

	Passenger Revenue	U. S. Mail	Property	Other	Freight Index	Total Operating Revenue	Total Operating Expenses	Net Income (Loss) (Tired)	
DOMESTIC TRAFFIC									
American	41,261,460	1,001,340	8,914,117	31,272	40,261,462	47,444,874	3,340,301		
United	37,918,460	889,384	8,912,718	61,718	16,395,503	13,231,831	718,737		
Continental	33,075,149	221,117	7,738,079	57,129	12,444,184	16,116,509	-1,688,719		
Eastern	5,262,507	154,448	2,388,474	4,587	2,486,100	2,836,362	-350,282		
Delta	29,752,149	1,000,000	1,000,000	22,511	10,255,441	10,248,564	-126,859		
Trans World	41,625,149	1,002,243	2,089,163	16,193	12,735,303	16,755,664	-4,020,611		
National	15,802,473	393,450	8,918,158	42,003	7,228,826	12,822,747	-593,921		
Midwest	10,765,473	1,000,000	8,912,718	4,587	5,228,826	6,148,362	-920,536		
Western**	10,765,473	1,000,000	7,738,079	57,129	12,345,493	14,485,599	-9,140,646		
Trans World	43,317,102	1,000,175	2,364,787	76,920	8,874,701	12,392,376	-3,518,698		
United	35,101,102	1,000,175	1,000,175	21,583	12,350,261	13,396,193	-1,046,251		
Western**	2,107,028	104,001	4,200,120	12,263	4,108,389	4,945,041	-846,652		
INTERNATIONAL									
AACICO	—	3,228	262,817	1,463,819	—	1,818,491	1,846,754	28,257	
Aeroflot	1,027,119	3,248	1,027,119	—	1,228,200	1,244,883	-16,683		
Aerolineas	1,246,400	54,449	1,000,000	—	3,014,331	3,212,331	-200		
Caribbean Islands	263,208	8,286	21,387	3,617	497,194	507,401	-10,207		
Gulf Air	1,487,900	14,407	41,078	2,481	1,627,928	1,687,948	-60,020		
Sabena	2,408,100	1,000,000	1,000,000	8,448	4,245,100	4,287,857	-42,757		
Swissair	2,000,000	—	7,600	1,488	3,199,993	3,219,307	-19,314		
National	1,364,410	11,475	8,710	11,702	1,314,720	1,316,711	-188,011		
Northwest	1,797,270	1,000,000	7,738,079	57,129	6,439,141	6,436,041	-3,007		
Pan American	860,380	41,118	1,000,000	—	—	—	—		
Aeroflot	1,027,119	3,248	1,027,119	—	—	—	—		
Aeroflot	18,107,000	1,000,000	2,761,194	937,993	26,419,101	27,101,319	-682,218		
Latin American	12,400,207	103,726	2,025,779	2,281	29,446,861	31,765,812	-2,319,951		
Pacific	11,740,000	1,000,000	1,000,000	1,000,000	1,477,300	1,477,300	—		
Peru	2,105,208	181,344	817,100	41,497	8,038,331	8,475,833	-437,502		
Trans T	—	—	—	—	8,449,914	8,501,640	-511,726		
Trans Caribbeans	100,000	—	—	—	178,207	186,556	-8,349		
Transair	9,140,100	1,000,000	914,894	480,361	13,320,200	17,000,000	-3,679,800		
UCCA	8,140	—	—	—	99,367	100,319	-8,952		
United	8,601,440	87,720	61,633	32,000	2,710,487	2,704,180	-31,307		
Western**	393,173	509	5,581	2,203	206,266	205,746	-511		
LOGISTICS SERVICES									
Airfreight	1,044,198	90,483	49,703	1,452	214,021	1,710,140	1,188,022	-453,491	
Aeroflot	—	—	—	—	1,104,211	1,104,211	—		
Delta	482,174	7,180	28,743	8,858	299,262	311,211	-11,949		
United	1,044,198	90,483	49,703	1,452	1,104,211	1,104,211	—		
Western	941,193	95,118	10,293	16,293	290,300	297,477	-7,177		
Delta Control	1,021,208	12,246	18,131	3,342	447,844	497,484	-51,640		
North Central	1,201,644	13,248	42,407	18,828	250,184	2,180,450	9,140,000	2,000,000	
South Central	1,201,644	13,248	42,407	18,828	250,184	2,180,450	9,140,000	2,000,000	
Central	1,201,644	13,248	42,407	18,828	250,184	2,180,450	9,140,000	2,000,000	
Eastern	1,201,644	13,248	42,407	18,828	250,184	2,180,450	9,140,000	2,000,000	
Pacific	1,021,208	13,248	42,407	18,828	250,184	2,180,450	9,140,000	2,000,000	
Mountain	1,021,208	13,248	42,407	18,828	250,184	2,180,450	9,140,000	2,000,000	
Transair	751,323	25,200	44,881	11,910	197,041	1,636,700	7,426,792	-25,999	
West Coast	624,414	10,723	17,323	8,722	438,301	1,110,857	1,084,363	-27,511	
CARGO AIRLINES									
Newair	817,921	3,547	110,391	1,346	1,103,314	1,238,204	-134,890		
Trans-Pacific	395,173	1,033	20,011	440	24,486	493,196	-498,712		
CARGO AIRLINES									
Aeroflot East Asia	174,121	64,111	—	—	476,150	478,208	-12,058		
Flying Tiger	16,821	2,122,917	4,124,428	—	4,810,159	7,414,814	-2,603,975		
Malaysian	16,496	1,001,199	1,386,220	—	2,360,150	2,872,150	-512,150		
Swissair	16,427	481,177	937,168	—	1,201,301	1,556,947	-355,646		
MICROFLITE AIRLINES									
Chicago Helicopters	120,416	18,458	1,177	—	292,910	408,265	466,971	-25,487	
Los Angeles Airways	127,212	20,120	11,197	—	351,198	318,160	205,038	99,368	
New York Airways	115,317	18,248	10,833	4,224	392,312	394,171	-99,759	-11,463	
ALASKA AIRLINES									
Alaska Airlines	227,728	114,957	168,428	327,907	321,723	1,318,081	1,109,064	-2,178	
Alaska Central	123,953	32,148	35,859	17,000	64,003	344,385	344,385	—	
Concord	22,119	12,123	17,000	17,000	17,000	216,118	6,395		
Delta	27,555	19,136	11,178	2,981	48,207	117,895	529,640	-431,357	
Horizon Express	127,420	83,712	22,707	38,364	187,091	506,467	528,913	-23,489	
Pacific Northwest	416,329	64,407	74,741	2,321	187,023	1,764,300	1,915,717	-151,416	
Trans	123,291	79,446	20,543	9,119	187,023	200,749	-13,726		
West Alaska	111,196	112,483	42,802	142,208	365,393	356,758	831,737	-102,437	

* Not available. ** Western Airlines & Delta Air Lines are members of the U.S. Eastern Airlines Board.

Cancelled by AVIATION WEEK from other reports in the U.S. Eastern Airlines Board.

AVIATION WEEK, July 25, 1958



600,000 takeoffs and landings at N.Y. International Airport are serviced by Airport Surface Detection Equipment under new radar evolution. Three aircraft are seen waiting to land (bottom center), one aircraft has landed (lower left) and is being taxed off the runway.

Idlewild Radar Surveys Taxiways

New York-Crosswinds traffic at New York International Airport is under investigation by an improved Airport Surface Detection Equipment system recently installed at Idlewild's control tower for Civil Aeronautics Administration use and evaluation.

The narrow-beam "line scan" provides a high definition picture on its scope to give controllers an exact fix on each aircraft or non-identified piece of ground equipment on a runway or taxiway. Radar coverage is limited by the distance that controllers need to see for safety to be sure that aircraft or vehicles have cleared active runways.

Increasing the radar coverage area to cover all taxiways around the tower is in the works, according to Arlene Modell, a spokesman for Arlene Modell, Inc., which is managing the project to be completed in about six months.

The Idlewild antenna, a four cubic yard steel lattice tower 150 ft. high, is located in a park-like setting in Arlene Modell's office building in the Bronx.

The antenna sits in the narrow berm just to the west of the main runway. Frequency is 2400 mc.

Half-power beamwidth of the high-resolution radar is 15 ft. at 3,000 ft. from the antenna, and 10 ft. at 10,000 ft. at the edge of the beam.

The radar experts are put in fast at Idlewild into European and Mid-East service next year, probably in a 75 passenger aircraft configuration. The second set will be scheduled for 1960. Total seating for the first aircraft is 540 passengers.

Frequencies would be increased to three daily roundtrips en route after initial service, American said. Both first class and coach accommodations are planned. If the weather is right, an assault plane will appear so early that passengers can board the aircraft in their seats.

The assault plane will be dual configuration at least during the early stages of jet operation.

American plans to inaugurate New York-Los Angeles jet service around the same time.

KLM, Aeroflot Plan Reciprocal Service

KLM Royal Dutch Airlines and Soviet's Aeroflot will begin weekly services between Amsterdam and Moscow next month on agreement reached between the Netherlands and the Soviet Union.

The Dutch carrier DC-6B will use Aeroflot via Warsaw, while Aeroflot will use KLM. The two carriers will share the same aircraft.

AVIATION WEEK, July 25, 1958

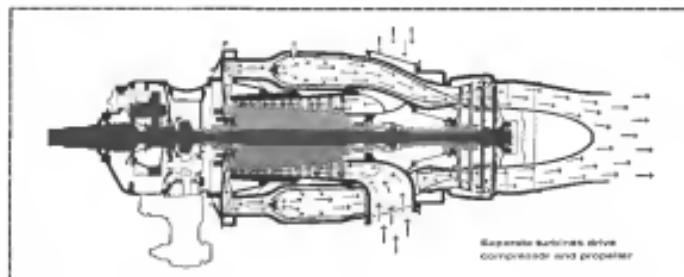
45

BRISTOL: Power for the Wings of the World—No 5

BRISTOL PROTEUS



most powerful jet-prop in airline service



PROTEUS POWERS THE BRITISH-BEAMED BRITANNIA The Bristol Proteus is the most powerful, most advanced jet-prop in commercial operation today—approved without reservation for use in passenger-carrying commercial aircraft. The Proteus is the first axial engine to reach the skies of the world.

It is installed in the Bristol Britannia—currently setting new standards of reliability free world record on record-breaking transatlantic and Mexico City-New York schedules.

Unique advantages. The Proteus is unique in having the Bristol pioneered free-turbine concept. This system gives high efficiency over a very wide range of operating conditions with a low specific fuel consumption—lowest of any gas turbine in service, today or ever! In addition, because it allows low propeller speeds, the free-turbine system results in an exceptional degree of quietness—startling in noise and control systems are greatly simplified.

Unprecedented reliability. The Bristol Proteus has a magnificent record of mechanical reliability. The 700 version started airline operation with an overall life of 500 hours. As a result of its performance in service, the overall life has already been officially extended to 1,300 hours—in just thirteen months of operation—the most rapid increase in service history.

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THE BRISTOL AVIATION PARK (B.A.P.) INC.
400 PARK AVENUE, NEW YORK, N.Y.

Drag Devices May Aid Satellite Recovery

By Richard L. Sweeney



Honeywell's RAM a NEW
2-axis gyro designed to withstand
missile shock and vibration. Maintains tight accuracy
under high acceleration and severe vibration. This hermetically sealed displacement
gyro is smaller and lighter than its predecessors. It was especially designed and has
been sled-tested for missiles and advanced aircraft.

Specifications

Gimbal Precession: $45^\circ/\text{sec}$ or $90^\circ/\text{sec}$ in roll

Precision: Roll: Within $0.5^\circ/\text{sec}$ according to customer requirements

Damping Rate: Free drift rate is within $2^\circ/\text{sec}$ during rotation of 0 to $3000^\circ/\text{sec}$ or $12^\circ/\text{sec}$

Shock Resistance: Designed to withstand drag shock

Environment Ratings: Temperature range: -115°F to 160°F ; 100°C plateau

Angular Momentum: 1.5×10^{-3} to 3.7×10^{-3} gm cm²/sec. (for customer requirements)

Rate Speed: $\pm 600^\circ/\text{sec}$

Size: $4.5 \times 6.6 \times 5.1$ inches

Weight: 4.5 pounds

For further information write:
Mississippi Honeywell Aero Division,
Dept. APO 2 MR,
3430 Ridgeway Road,
Montgomery, Alabama

angular orbit altitude and speed to final orbit.

However, the paper indicated, deorbit from 450,000 ft to 100,000 ft using a very large drag device would reduce heat inputs and witness temperatures.

Drag Devices

Among conventional drag devices, parabolas appear to be the only feasible choice for large drag areas. The paper indicated, requiring the low orbital eccentricities of 0.001 .

Although little is known at present of devices used at high Mach numbers and low densities, radiation problems should be lessened since the tropical force impacts parabolic flight (and extension) could be effected by a rubber or plastic tube attached to the staff.

A metal parabola could be installed by a series of sprags attached between adjacent panels.

The paper added that these artificial means of inflation may not be needed, since it has been reported that in Earth orbits self-inflation rates have occurred as high as 40% .

Calibration temperatures to be guaranteed by the parabolic material should be such that they allow a range of motion, leaving the possible extremes of opposite use of west and type one lateral or of altitude type control, or use of residual which can withstand the surface equilibrium temperature with the last being the most popular.

Use of metal sprags or woven metal cloth for the ribbons was projected.

Change in Fixed Orbit

Changing from original to final orbit by steerable solar sail deflections are favorable in the satellite range, have advantages of cutting synchronous heating, reboiling time, and shields limiting possible travel distance errors.

Use of drag arms for deorbit has several aspects and varying relationships with attitude and entry angle. Use of the drag arm produces a constant deceleration of 42G over a period of time.

Dragarm could be based on a satellite thickness of $100,000$ ft, with a maximum effective drag area of $1,000 \text{ sq ft}$, giving to 900 sq ft minimum a orbital effective drag area of 50 sq ft . In the reported variation, the paper states, could be achieved through a combination of reboiling reeling and letting out of a paracord.

Stagnation point temperatures pose a most severe problem on most configurations and here again use of retro rockets to descend to final orbit altitude would be best in their reduction of exposure to heat loads, rather than use very large drag areas, which still would require more reboiling to drop from

stagnation point temperatures down to 100°F .

Estimates on weight of a variable area ring device would be on the order of 175lb . This is based on a system using high-temperature-resistant steel plates and programmed rotations or reflections controlled according to issuing of given atmospheric loads,

with an area reduction ratio of 5 to 1 .

After the variable area drag device has deorbited the vehicle and reduced its altitude sufficiently, deployment of a conventional parabola at speeds of less than Mach 1.5 would accomplish final recovery after suitable orbital speed has been reached. Use of a high drag vehicle configuration is deemed desirable due to ease resulting in a simple setting parabolic system for this final maneuver.

A paper by Dr. Eberhard Baedke of Jet Propulsion Laboratory outlined a number of unexpected occurrences in connection with satellite tracking.

First unexpected occurrence, according to Baedke, was the appearance of a Russian satellite instead of a U.S. satellite.

One of 70 to 80 new orbital of the U.S. 108 Hz frequency band for propaganda policy and study of the atmosphere, with several strange effects in the atmosphere are being noted. Radio noise would get trapped under ionospheric layers resulting in stations continually removed from the satellite path being able to hear the signals for considerable lengths of time with no periodic spinning from one half hour to an hour and a half.

Precision Noted

Another effect was appearance of a short 30 sec before the start of the moon satellite signal. These phenomena could be tracked by interferometers or other tracking devices and coupled with speed of knowledge, enabled observers to tell if the satellite signal was emanating from a satellite located in one region of the ionosphere or being trapped in the ionosphere or being reflected by one of the several reflecting layers.

One of the most interesting was the "ionospheric current" condition in which the field line was influenced by magnetic fields caused by the paraboloid, resulting in increase of total drag while decreasing heat loads.

Use of magnetic fields in combination with conductive metal drag was construction right plus a very unique part in variation of drag area. The paper indicated.

Estimates on weight of a variable area ring device would be on the order of 175lb . This is based on a system using high-temperature-resistant steel plates and programmed rotations or reflections controlled according to issuing of given atmospheric loads,

Honeywell

H Military Products Group



Peter F. Wolf, Director of Communications,
Western Airlines

Sgt:

"G-E 5-Star Tubes help make our Flight Simulator the nearest thing to piloting a plane!"

Instrument flying and landing are stressed in the pre-flight training given Western pilots and co-pilots. Every instrument, indicator, and control found in one of Western's DC-8's is duplicated in our Flight Simulator—right down to General Electric's 5-Star Tubes for maximum reliability.

The picture shows me pointing to one of these G-E tubes as I stand beside the Simulator. Because equipment in this \$750,000 training device is fully reliable, our pilots from the start gain confidence in their instruments. Even when flying blind—note the cover over the window—they learn to operate a plane with assurance and safety.

All through our fleet of planes, General Electric's 5-Star Tubes are installed in critical communications and navigation systems. The failure rate of

5-Star Tubes has proved to be exceptionally low. They're long-lived—they help Western maintain fast flight schedules, and keep our electronic equipment in the air and out of the shop. No better receiving tubes are built, from our experience!

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when a given pair would change from pin to pin, yielding a ground effect of putting deep holes into signal at periodic intervals. Periods of between 15 sec and 15 milliseconds were observed and the period measured depended on whether or not Spacelab was approaching the magnetic pole or two along parallel to it.

Additional confusion was created by an anomalous telemetry tape aboard the Razzouk satellite, with frequency modulations appearing as a result of the Spacelab Al prime.

Signals emitted from Explorer 1 also caused some sort of a response. Expected to produce a relatively constant signal with small modulations due to spin, the satellite signal emitted developed flicks which increased in depth from insertion into orbit for several days until they reached a relatively stable condition near data rate.

It developed that Explorer motion was affected by electrons that passed into the magnetosphere and gradually turned into protons with resulting signal change. Explorer's original park and a spin-off rifle bullet wound up like a gyroscope.

The Razzouk paper also indicated that a drift in best orientation in extra-terrestrial time zone. Illustrating his point was the data characterized from Nanhai and Singapore where earth's induced instrumentation was malfunctioning.

Lots of new information, but in those areas the data was correct but that this was when the basic electron fluxes were being measured and Geiger tube saturation was occurring. The original findings from Explorer 1 were verified by Explorer III.

Another strange occurrence, of Explorer 1 was the appearance of a dual transmitter, one intended to operate for 10 days at 100 milliwatts and the other, an alternative transmitter was operating for 23 to 27 days at the 10 milliwatt level. The conclusion according to Razzouk is that after a life test has been completed, long testing for a long time is not come back to life immediately.

A writer for Landing Defense wrote an inscription on the surface of the nose cone among inflatable long-duration spheres with a position in a protective position in the center was proposed by Kurt Elstede, German Astronomer.

Elstede's proposal called for use of the spheres in conjunction with human satellites, which data could be taken to look for the effects of the nuclear fallout. Some of the inflated landing spheres could be stored in each space satellite in the collapsed state and could be inflated at the time of deployment toward the moon's surface. Sphere design and construction would

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Aviation Industry Debt Pattern Changing

By William H. Gergen

New York—Debt patterns of the major industry are undergoing significant change. Not only is short term barrowing from banks rising to higher levels, but also substantial new money is spreading to the industry.

Boeing, Inc., the largest firm in the industry, has debt totals of well over \$30,000,000 in convertible debentures to stockholders and \$60 million in nonconvertible debentures to the public that maturing (AW June 18 p. 22). The Martin Co. had planned to offer \$20 million nonconvertible stock last week but delayed the offering.

An Aviation Week survey and tabulation of 12 aircraft companies put their total long-term debt, including their current assets at \$387 million, more than double the figure at the end of 1958. Short term debt for these same companies, measured by the end of 1957 was \$796 million.

Because of its rapid expansion and increasing long-term debt, a healthy estimate of 21 percent growth in the industry over the next five years. In the unlikely event that all these 12 companies were to borrow the maximum amount of the base of bank credit they have established, according to the latest figures available, the total would reach about \$676 million. On combining this figure with long-term debt, the total would exceed a billion dollars. This figure gives some weight to what the entire industry debt situation may be.

Aviation Week asked these same companies whether this continued trend starting 1958 seemed to be something with a specific cause or just a general upward movement in itself, but might be dangerous if the whole industry were to have to borrow it once. Others complained that the interest charges are not allowable though they did not share concerns of borrowing itself.

One company, *Journal Aircraft*, felt that any debt is a reflection of concern. Dugay de launay explained that not necessarily relate to the amount of debt but the concern that did take place, the general view of the situation. Douglas, however, was engaged in no borrowing.

These views are not contributions of disinterested financial analysts. Not owing itself is an accepted management part of business ethics. And the figures mentioned here seem relatively small when compared with the total gross short and long term corporate debt of \$216 billion at the end of 1957.

Indeed with the aircraft industry having to speak with investors frequently concerning rebirth, it requires large short term bank borrowings when big contracts become available.

The potential danger, as Douglas pointed out, is that the industry is being faced with a permanent change in its capital structure that will bring about dramatic changes in long range.

There while increased borrowing on the stocks might not be considered threatening, this may be regarded as a symptom of danger when placed in perspective with the factors:

- Reduction in program priorities for military business which have introduced an artificial and reflexive element into the aviation finance picture. Because of the slow paying customer, we will witness in all types of business.

- Increases are among, due in part to the reduction in priorities. According to the Aircraft Industries Assn., the rate from 50.75 percent in 1956 to 59.75 million aircraft, is the highest profit rate ever to an aircraft and general growth of the industry. This figure has been rising with the last 10 years.

- Revenues are rising, also a normal consequence of the armament reductions. This as well as a measure of the growth of the industry itself. AIA points to an increase from \$944 million in 1956 to \$792 million in 1957.

- Fixed assets that is investment in company owned facilities in using AIA quoted a 12 company total for plant investment rising from \$154 million in 1952 to \$471 million last year.

- Some companies have reached the maximum borrowing available on basis of maximum amount of funds through public offerings. Most of these long term offerings have been debenture-on-effect instrument bonds. In some cases, these have been capitalized successfully without losing control. Douglas, for example sold its latest \$60 million issue without capitalization, though it got off cheaply.

- Reworking up as a plan for the industry weathered the first short war warning. When the war warning notice listed market it was found the industry would need to borrow a billion dollars to meet the shift of the backlog waiting to proceed. There was talk of a government-backed V loan program. Actually the total came in about \$300 million, one banker said.

- Industry weathered the first short war warning. When the war warning notice listed market it was found the industry would need to borrow a billion dollars to meet the shift of the backlog waiting to proceed. There was talk of a government-backed V loan program. Actually the total came in about \$300 million, one banker said.

Financial and the banks were able to handle medium maturities for the most part.

- Industry has met little difficulty in financing money, either short or long term.

- Increased borrowings to some extent can be interpreted as a sign of confidence in the future of the industry and economy. Many firms do. However, the flight or defense profit margin below 10% leaves less and less room for financing of privately owned facilities on which the government is investing more and more and to even heavy investments and acquisitions.

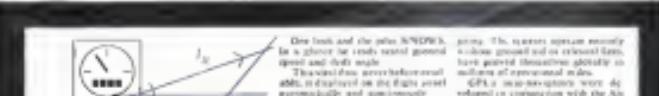
- Most companies in the Aviation Works, seems suspended, that they would like to borrow further than ever. Douglas pointed out that the bankers in east reinforcement from 100% to 90% on cost plus fixed fee contracts will play an increasingly important role as in building requirements. This is notwithstanding because of the need to award long research and development type contracts for industry with the public transition area.

- All companies would prefer bank financing. Prime interest rates for bank loans, which was running around 4.5% during the tight money period last year has dropped to 3.5%. Even though need for continuing inflations, usually 10 to 20% of the volume of the loan which must be left on deposit has caused that to an effective rate of 4.5% in a divided case. This is less than long term financing rates at 5% or 5.5%.

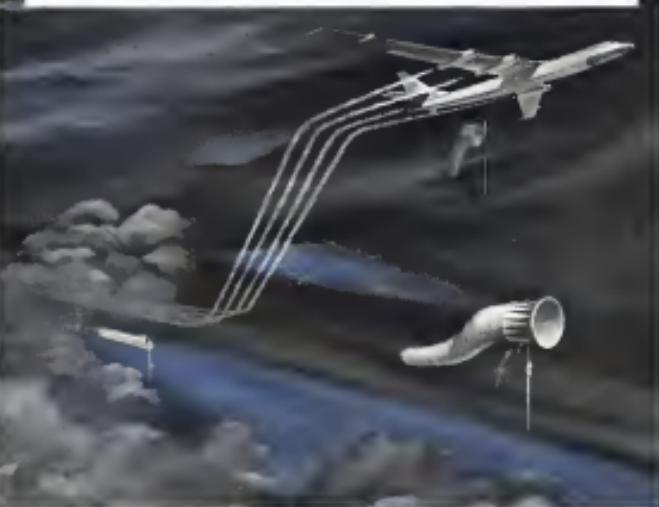
- Some companies have reached the maximum borrowing available on basis of maximum amount of funds through public offerings. Most of these long term offerings have been debenture-on-effect instrument bonds. In some cases, these have been capitalized successfully without losing control.

- Often these debonaries have to be withdrawn by the buyer by invoking the conversion right. That is, the debonaries can be exchanged for common stock at fixed price selected before the issue is sold. If the price goes up, the buyer can convert. Should the stock show appreciable appreciation over the year, the convertible debonaries often then make a profitable profit.

- While some companies are thus forced into long term borrowings, others feel it necessary to carry the long term



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Drones are required to serve as targets for the evaluation of nuclear weapons, the training of weapon crews, and for aerial surveillance. Each of these vital areas requires a unique drone application. For this reason, Radioplane has developed this family of drones (left to right):

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QD-1 Standard radio-controlled aerial target for all the military services, the tank-cripple and versatile DQ-10 drone is used all over the world as an economical training target.

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RP-710 Powered by Boeing magnet AR-30 turbogene engine, the RP-710 provides high speed, and both high and altitude performance at low cost for the testing of gun and missile crews.

RP-712 The RP-712 will carry the RP-76 target shaft for launch, at altitude over the Army's Blue range, then eliminating the need for diverting a manned plane and crew into a worthless job.

RP-76 (Drones attached to the RP-712.) The rocket powered RP-76 has very high altitude capabilities for training the Army's ground-to-air missile crews against fast, realistic targets.

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Radioplane has been selected by the U.S. Army to provide complete counter-air warfare services at White Sands Proving Grounds, New Mexico. This includes research, training, aerial targets, ground support equipment, and operations, training, and maintenance personnel.



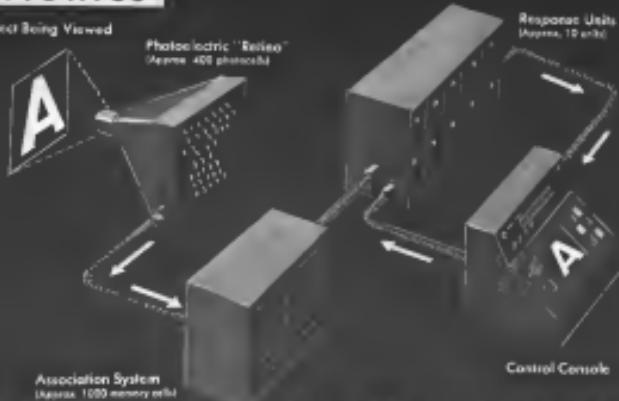
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Object Being Viewed

Association System
Memory 1000 memory cells

Pilot model of a Perceptual cell being built during the meeting final stage of the Cornell Acoustical Laboratory will resemble this sketch. Machine will require "cell" of photodiodes. Other sensory systems could be used. E. G. radio cells take sensory systems logically would relate the association to sensory cells which would in turn invoke a response from the machine. On the pilot model

response will probably be made by lights or printing code letters. As reflexo-percepto could learn to speak and answer verbally, total number of sensory units and response units has not been definitely set. Capacity is to handle optotypes during "learning" session. It is believed that full-size Percepto could eventually be made the size of normal desktop.

Electronic Device Simulates Processes of

By J. S. DAVIS, Jr.

Washington—New statistical theory which is the basis of an electronic device that simulates the thinking processes of the human brain and may explain the mechanism of learning and memory has been developed by Dr. Paul Rosenblatt of the Cornell Acoustical Laboratory under the auspices of the Office of Naval Research.

The new theory has been proven experimentally through a system known as a model of a machine called a Percepto which has already demonstrated its ability to teach itself.

IBM 704 Used

The work so far has been conducted on an IBM 704 computer especially programmed to simulate the Percepto's unique working. This has resulted in a slow motion model of the Percepto that takes about 40 min. to accomplish what an actual Percepto could do in a few hours. Hundreds of a second.

This work has been under ONR sponsorship for about one year. Dr. Marshall Tye, the ONR project of-

ficer who has adapted it to his responses so that one can always guess where a square is located on the left side of the field, and the other when the square is to the right.

This was the first time that a machine had learned to respond after it had taken some kind of organized form of information into a concept. Later experiments have shown the machine to be capable of reading small size differences between several letters of the alphabet.

Human Brain

predicted situations and many others.

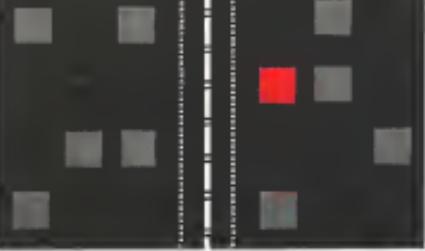
Rosenblatt and Yeshenko believe that the main problem now is to develop such a fast, inexpensive and reliable integration to serve as the memory cells of the Percepto.

Currently available equipment which could serve as integration unit in the neighborhood of \$100 per unit and, compared with some of the proposed units which are considered to be possible ones, are comparatively large and heavy.

Size and Cost

It is hoped that the 100,000 memory cell Percepto would not be larger than a normal size desktop and would not cost more than \$1 million per unit.

The memory cells in the pilot model of the Percepto will probably be large electro-mechanical units, as complicated and relatively expensive, but can be counted on for reliable performance. It has been estimated that the construction of the pilot model and



model building are likely to respond to widely varying stimuli. Even more than the memory cells, indicate that they must be used to simulate mechanisms of learning process. Motor units in response system is quite automatically controlled. Passage on which greatly resembles the biological situation is based on the law of probability as applied by Cornell Acoustical's Rosenblatt.



RELIABILITY or The Wonderful One-Hoss Shay

A Logical Story

Have you heard of the wonderful one-hoss shay,
That was built in such a logical way?
It can a hundred years to a day?

"For," said the Deacon, "it's mighty plain
That the weakest place must stand the strain;
And the way to build it is only just
To make that place as strong as the rest."

The Deacon followed the two cardinal principles for reliability.

1. Know the stresses your component will be subject to (in other words know the environment).
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The Deacon's Maxims as *The Wonderful One-Hoss
Shay* by Oliver Wendell Holmes sent upon request.



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TOOK TO CPPC FOR SYNCHRO

obtaining the first significant data from its operation will probably require a year with the present effort.

A description of the Perceptron which will appear in an issue of Naval Research publications "Research Reviews" in the near future reads as follows:

The Perceptron is the first assembled nervous system known to be capable of classifying incoming and outgoing information more closely than any other machine. The sensory cells of this system are less in number than those of the human brain and the motor cells are far fewer. The neurons of the Perceptron are for the most part wired together randomly and not connected in a precise pattern as in an ordinary electronic computer. Most of the cells are excited together when information is sensed by the Perceptron rather than using a separate sensor cell to sense each bit of information.

In comparing the most modern digital computers, someone once called them "brutes," could be described as very rapid adding machines which stop or bark, when any unusual situation is required.

They are dependent on man to set up or program the method of solving all problems.

The Perceptron can receive its data through audio, visual and the other types of sensory neurons which supply information to the human brain. Radar and other electro-magnetic devices could also be used as sensors. Artificial sensory units would provide the Perceptron with a much wider "range" of

experience than any natural system but obviously they could not match human sensitivity and resolution of certain areas.

The "trained nervous system" of the Perceptron which takes this nervous system and makes it, classifier, it and uses it to form concepts, is believed to be similar to and analagous to the nervous system in approximately the human brain more closely than any other machine. The sensory cells of this system are less in number than those of the human brain and the motor cells are far fewer. The neurons of the Perceptron are for the most part wired together randomly and not connected in a precise pattern as in an ordinary electronic computer. Most of the cells are excited together when information is sensed by the Perceptron rather than using a separate sensor cell to sense each bit of information.

This agrees with generally accepted physiological findings which indicate that the area that connects long sensory and motor nerves are organized and modifiable except through the association or "linking" cells which are apparently connected randomly.

An interesting feature of certain portions of the brain cells through part of their orderly network of direct connections and can impinge the sensory and motor functions. On the other hand the neurons appear to be distributed throughout the association



Radar Coordinates Missile Firing

Primary radar for Army's Manned Minuteman System at Convair Electronics Co.'s AN/FPS-33, used in conjunction with the AN/FPS-33 height-finder. Minuteman is designed to coordinate fire of Air and Hawk missiles in defense of the U.S. First operational AN/FPS-33 has been installed at Fort Meade, Md., initial Minuteman installation. New radar combines two improved AN/FPS-33 radars with a search design mission antenna to increase range coverage by 30% and to extend electronic coverage according to the company. As previously designed, identification of a Minuteman radar target is fixed or must be obtained from the local SAM, Defense Control.

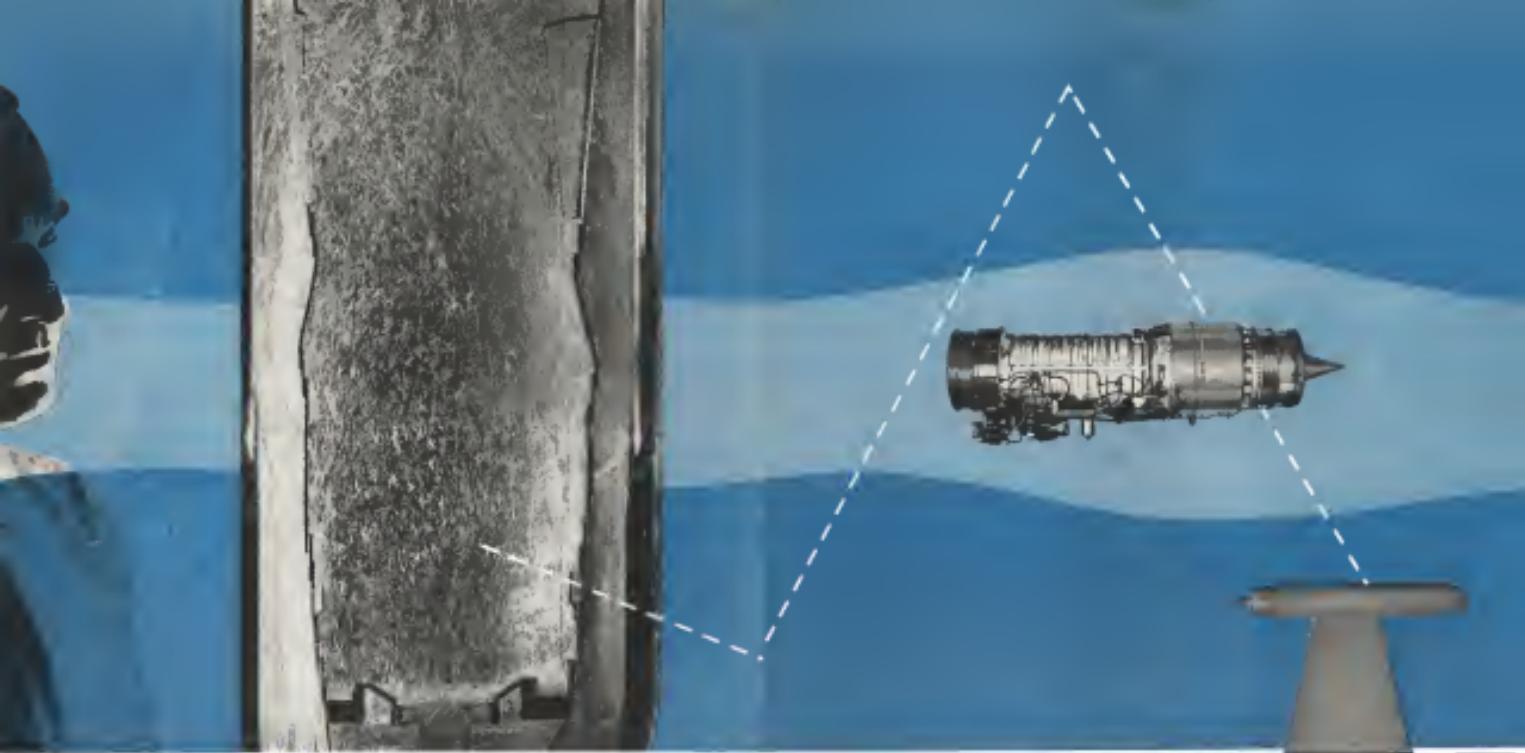


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Development of the latest J34 configuration for use in North American Aviation's T-33 trainer proved the value of this water flow analogy test

rig when design modifications to permit the use of avgas and JP-4 or JP-5 were quickly and accurately evaluated. This is just one of the many complete facilities for research, design, development, testing and production of jet engines at the Aviation Gas Turbine Division, Westinghouse Electric Corporation, Box 288, Kansas City, Missouri.

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Now...major components for weapons testing and control systems come as reusable, universally adaptable modules

It's called MATE—Modular Automatic Test Equipment—so no go reading is now a mandatory step in eliminating checkouts in automatic testing systems.

After extensive surveys, AMF has found that all electronic systems, regardless of type or complexity can be reduced to the same basic packaged components:

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AMF has already designed and produced 10 of these modules which form a self-contained package with a distinct interchangeability. Available to you are an "off-the-shelf" basic core, RF preamplifier and controller, digital signal translators, amplifiers, comparators, multiplier modules and display devices.

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These modules not only plug together in preparing for automatic testing programs, they are also designed to integrate with existing equipment of other manufacturers.

DISCRETE ELEMENTS

After meeting their needs for the system, individual MATE modules can be re-integrated into other systems requiring the same functions. The result: complete flexibility in the most complex systems; low-cost components available on short delivery, pre-designed to accomplish many dif-

ferent tasks; modules that retain their identities and identify after weapons systems sub-blocks. The resulting economies to prime contractors and the military are enormous.

MATRIX EFFECT OF MATE

The response of all types of weapons hardware can be evaluated with MATE, including electrical, mechanical, and hydraulic. Signal Requirements and Specifications must meet the STATE if it is to be applied. The system is designed to match most commercially-available transducer elements. From transducer to display device, MATE modules take over.

Control—the test sequence is generated through sequential programming equipment—pushed tape, punched tape, magnetic switch or a combination of both.

Signal Interchange—A key feature of MATE is the use of either analog or digital interconnection which evaluate data without conversion. Analog comparators operate from 5 to 30 mV with a nominal operating level of 15 mV. Analog threshold levels are available to convert transduced and other complex data for the analog comparators.

Reference—Because the entire system is normalized to operate at 10 vdc, just one reference supply of 10.000 vdc, accurate to $\pm 0.02\%$ is required. Methods are provided for re-

fining test modules that retain their identities and identify after weapons systems sub-blocks. The resulting economies to prime contractors and the military are enormous.

Wire Interiors Reused—Write to Automated Electronics Products Co., division of AMF, 2709 North Georgia Avenue, Glendale, California, or to AMF, Government Products Office, Washington, D.C. or Dayton, Ohio, or Los Angeles, Calif.

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cells and partial removal of this tissue has little effect on the incision.

Kasabekis' theory of human perception rests on two general assumptions. The first is the concept of the "distributed" nervous system described and the other is the psychological premise that an intelligent organism must obtain an understanding of its environment through learning and experience rather than through inherent knowledge.

In keeping with these assumptions, the various cells of the Percepton are all of equal strength and completely unbound and unprogrammed before the learning process begins. The connections between the various cells are randomly distributed cells in the sense that most of them do not follow a regular repeated pattern. This does not imply that the connections change while the machine is in operation.

New Percepton Leaves

The Percepton learns and classifies information in a fairly raw or unorderd state. Using the word of phrase "Percepton" as covering the machine as an environment, there is less which forces the machine to learn a "natural" or photostatic cells. Each stage, or stimulus, activates a portion of the photostatic. The signal flows from the activated photostatic passes randomly through a portion of the various cells as it reaches the response cells, one or more of which would be turned. The response cells which conducted this signal to the "on" response are strengthened and their relative output signals tend to dominate the output of the other inactive cells. An effect of this is that a certain cell is reacted by the entire environment.

During the early part of its learning program the machine, like a human, tends to make mistakes. However, under repeated exposure to the environment some errors are gradually忍受ed, and it may be shown by probability, that certain stimuli never again will invoke the same response. The machine is then said to have learned and evolved certain "knowledge" about its environment.

The number of concepts developed with the Percepton and the machine will suffice to those who get the proper support for a great deal more work. In fact, because of the random cells and response units in the machine and the complexity of the environment, it is possible that the Percepton will not spontaneously think the few changes about the environment that would be of the greatest assistance to humans who were using it to classify data, etc. The classification that the machine can at right now can compare with that had been used in a growing field training film and human,

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MARTIN
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or in establishing human starting points in theoretical studies.

In cases of this type it is possible for the human operator to focus the machine to much improved coordinate control and to teach it. In an electronic example, a single Resistor with four response units should be able to distinguish between four different geometric figures or letters of the alphabet or ten gross shapes. If only two figures were used, the machine might learn one step above the location as well as the shape of the figures in an "field of vision," rather than above the shape alone. It is possible for an operator to create and readjust the proper movement of the machine to eliminate all errors from the desired concepts. This is done through the "learning switch" from the memory cells, or to the "memory cells" which are responsible for creating the memory traces when the machine is moving by itself. Each here has a responsive unit activated it sends a signal back through the memory cells that are called for its activation.

The feedback signal is the nucleus used to increase the strength of the memory cells and builds the memory traces. Physiologically, back signal "rewards" the pattern of memory cells that learned the separate part.

Creating Desired Concepts

A second switch enables the human operator to create the desired concepts within the machine. Located next to a "reverse" button, this switch allows one trace in the memory cells to be activated or "reversed" when a green triangle receives the proper response from the Resistor. If an undesired trace is given the operator may "print out" the memory cells which caused the response and lower their strength.

Rosenblatt's memory traces and the perception are based on the mathematics of probability, which do not in quite a complete description in strong degrees of the overall organization of an action. Such a loss allows the probable structure of a representation to remain static to be discarded from a group of inputs without losing the overall structural swing of the brain or memory cells.

The mathematical development which Cornell University's Rosenblatt uses the form of statistical separation, often from most of those pin units used in the study of mechanical computers and the human brain. These studies have generally depended on the use of symbols logic and Boolean algebra and require precise knowledge of the wrong and nothing ambiguous in the complete system before response can be determined. Digital computers are designed using these methods.

While Rosenblatt's theory gives the

HOW SCATE SOLVES

2 BASIC PROBLEMS in testing electronic systems

Many complex electronic systems—missile guidance is a good example—may require testing that takes days by conventional methods. Yet the end function of such a system may fail only a few minutes—**even seconds.**

Other systems, though less complex, must be tested in such large numbers that adequate personnel are frequently unavailable to perform tests by conventional means.

The SCATE system of automatic test equipment can solve both problems. It provides **self-checking** automatic testing which is fast, flexible and reliable.

The system evaluates all important parameters of equipment under test, including:

- 1 RF sensitivity, center frequency, band width, power output, noise figure
- 2 Audio frequency gain, band width, power output
- 3 Video pulse circuitry, including carrier detection, lock-in, filter temperature, pulse delay
- 4 Voltage levels, DC and AC
- 5 Servo response
- 6 Mechanical response

Stromberg-Carlson has standing designs for all the standard components which go into a SCATE system, and is fully experienced in designing custom components which may be required in any test system.

Complete details in the SCATE system and other Stromberg-Carlson automatic test equipment are available on request.

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"Match-box" Tubes

Novel rectangular storage drops for testing tubes, which provide greater stability, shock resistance and improved performance, yet prevent use of mass electronic structures in conventional tubes. They developed by Westinghouse Electric, the world's first designer. When 1.5 lbs. weight, they drop through 30,000 ft. without damage, reducing replacement, maintenance, reducing transportation. Weight permits many compact circuit layout, provides greater space between leads for lower inter-electrode capacitance.

Pioneering using remarkable qualities that the digital computer, the digital readout has the same advantages over the electromechanical that it does over more. The digital computer is specifically designed to perform calculations rapidly, making possible very simple and reasonably so that it can solve complex equations in minutes where it would require years.

Testing the Pioneeer has no weaknesses would be an advantage in testing the Juno and it could profit from here about the same number. In word numbers as easy

Pioneeer's Promise

Great strides are being made with digital computers but as far as mission usage for a given size, speed of operation and the ability actually to duplicate the human process of classifying information without direction, no digital project has approached the Pioneeer to measure.

Rosenblatt believes that the most valuable computers of the future will still combine features of both the Pioneeer and the digital machines. He also believes that they will be designed only after investigation in the field have disclosed more time to interdisciplinary study in contrast to the tendancy toward narrow specialization that exists in many quantum radio. Rosenblatt's Ph.D. is "go-go-gogo" but he has devoted some time in its initial development and continues when his research is finished. The use of ultrasonic waveforms will result from wave propagation through the fields. An Rosenblatt is 29 years old and should have considerable time to see if his point will be proven.

AVIATION WEEK, July 2, 1958

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Pioneer in the field of aerospace cryogenic systems, Pioneer-Central offers a complete line of liquid gas receivers, valves, and vaporizer piping for artificial atmosphere equipment and compartments cooling and pressurization.

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Pioneer-Central's cryogenic and instrument design and production experience is now being utilized in the production of cryogenic valves, pressure sensing probes and liquid level sensors for advanced missile systems.

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Pioneer-Central Division
SAVANNAH, GEORGIA



Expansions, Changes In Avionics Industry

Luton Industries has purchased 40 acres, Inc., Luton, N. J., adding to its existing manufacturing another 100,000 square feet of corporate, office, laboratory, and production space, making approximately \$10 million, employs 500 persons. David Inglett continues as head of Luton and will become vice president of Luton.

Other recent avionics expansions and changes at the moment fall in:

- **ESI-AN Computer Inc.**, will be a new name of Mack-Traco Inc. electronics division, following Mack's decision to get out of the electronics business. Mack will complete present commitments but is not accepting new business.

- Standard Research Institute has leased new Radar Acoustics group to carry out studies involving design and operation of proposed Air

Force AWACS after Service nation-wide radar storm detection network. Long range plans include research on application of computers to weather analysis and forecasting. Dr. Alvin G. H. Light heads new SRI group.

- **Kaiser Aircraft & Electronics**, division of Kaiser Industries Corp., has formed an engineering, development and design department which will be located at company's Redwood Machine plant in California. Wallace C. Green will head new group in addition to being responsible for Redwood plant operations.

- **Imc Electric Corp.**, Chicago, has acquired manufacturing facilities and product line of **Texas Instruments**' panel instrument department, which will be integrated into Imc's own instrument division. Texas Instruments is continuing to emphasize front panel instrumentation.

- **Electronics Corp. of America**, Cambridge, Mass., has established 21,000 sq ft manufacturing facilities in Puerto Rico, near San Juan, which will produce electronic controls.

- **Gilbar Electronics Inc.**, has granted ground for new 26,000 sq ft plant in Solikita Park, IL, which it is expected to employ 150 persons.

- **Longan Aircraft Co., Inc.**, Tammont, Calif., has acquired electronic assets of **Stout & Stub Co.**. New corporation which produces missile support equipment will be headed by John Dornier.

- **Standard Electromagnetic Inc.**, Lutherville, Md., producer of solenoids and other electromagnetic devices, has announced new 20,000 sq ft plant at Walkersville, Md.

- **Motorola Laboratories**, Boston, has become division of Colra Electronics Inc., San Diego. Paul Masa remains head of new organization and becomes vice president of Colra. Masa produces ultrasonic devices and instrumentation.

- **Nordic Ultrasonics Corp.**, White Plains, N. Y., has acquired **Astar Electronics Inc.**, Little Ferry, N. J., also producer of ultrasonics. New corporation will continue to present location, with Bertram Cating continuing as president of new Nordic subsection.

- **General Home Electronics Inc.**, Rosemead, Calif., is one of new firms which will design and manufacture custom glass, magnetic assemblies, dielectric lenses and related devices. Major items in production, Arthur Gould is vice president. Company address: 4138 Temple City Blvd.



KEY ENGINEERING OPENINGS AT VOUGHT

ELECTRONICS

Project Leader—Advanced Guidance and Control Systems for missiles and high-performance aircraft aircraft. They begin with investigation and theory and progress through prototyping and testing to final production. Key responsibilities: overall technical men who are qualified in these areas: Advanced design procedures.

Stability and Control Engineer, E.E., M.E., or A.P., with emphasis on flight stability and control problems or dynamics. Experience in aircraft or missile systems, extensive experience in analysis or closed loop stability studies. Participation in design of guidance and control systems for high-performance missiles and aircraft.

Aerospace Research Engineer, E.E., or Physics Degree with demonstrated aptitude for advanced design. To plan and/or projects involving design of fluid mechnical, thermal and structural components of aircraft structures for high-performance aircraft and missiles.

Fire Control and Maneuver Systems Engineer, Aerospace, Mechanical E.E., or Physics Degree, at least five years experience in radar data link or fire control systems, and strong ability at this work.

Test Equipment Engineers, Aerospace E.E., or Physics Degree and in least 3 years experience in aircraft test equipment. Desirable: broad background in electronics design with emphasis on digital computers or microwave systems. To pass in the design, construction, and maintenance for analysis and associated refinements.

Reliability Analyst, Aerospace M.E., Physics E.E., or Math Degree. Broad knowledge of electronic and mechanical systems, reliability analysis, environmental testing, reliability. Helpful: statistical methods experience.

To arrange for a personal interview, or for a prompt return on these or other current openings, please write to:

C. A. Beck	Manager, Engineering Personnel
CHANCE VOUGHT AIRCRAFT	Dept. 36-11
3000 Lasalle Street	
Philadelphia 3, Pa.	—
Specified in the opening for _____	
Name _____	
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Toroidal Coil Systems

Magnetically toroidal coils, which prove useful to be wound helically, can be produced by a new coil winding machine developed by Standard Research Institute. Typical toroid is shown in a fiber bobbin to demonstrate how the wire is wound.



Vought Vocabulary

in'ge-nu'i-ty: designing a 12-ton missile to fit inside an atomic sub

Chance Vought's **Ramjet II** missile is twice as long as a city bus. It is crowned with delicate instruments, armed with a nuclear warhead. Yet Vought engineers designed Ramjet II to serve safely, effectively aboard the Navy's newest nuclear-powered submarine.

They also profited the missile against underwater blasts. They considered it for polar ice, or equatorial heat. They made it — like Vought's smaller **Fleet baton**, **Regulus I** — a dependable weapon, accurate from conventional or nuclear war, from surface ships or highly maneuverable, mobile shore batteries.

Aboard its special globe-girdling web, **Ramjet II** will move inexorably any distance to its launching point. There



it can begin a supersonic, long-range strike in minutes. Or it may lurk unseen for months as a patient and ready deterrent.

A chilling prospect for would-be aggressors, this example of Vought ingenuity.

Selective and aggressive planning with Vought in new missile, nuclear strength, and electronic programs. For details on select openings write to C. A. Beck, Supervisor, Engineering Personnel, Dept. 36-11.

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NAA is at work in the fields of the future



THE DAY AN AMERICAN RETURNS FROM OUTER SPACE...

...will be another V-day for the free world—greater, perhaps, than any yet known.

In the inner offices of the Pentagon...in secret areas of our defense industry...no effort is being spared to speed the day.

For it will be a human pilot—in command of a craft that will bring both him and his secrets safely home—that will truly conquer Outer Space.

The first American craft to attempt this conquest is now in its final construction stage. It's the X-15, missile-shaped and rocket-powered—product of a scientific program sponsored by the National Aerospace Committee for America, the Air Force, and the Navy. It will discover what man encounters when he enters space—and when he returns to the earth's atmosphere.

America is closing the gap

The Army's Explorers give us dramatic

proof that America had not been lagging in the race to space. The rocket engines that put the Explorers into Outer Space were minor modifications of the same engine NAA's Rocketdyne Division has been developing in the Army since 1952. Four of America's major missiles use engines built by Rocketdyne, the Air Force Atlas and Thor, the Army Jupiter and Redstone.

Missiles of all types are principles discovered by Missile Development Division in its 12-year research program. This division is now at work on



Back from beyond, the pilots of NAA's X-15 rocket plane will report on the new problems man discovers in Outer Space.



Outward bound, USAF's Thor rocket into space on the mighty thrust of a rocket engine built by the Rocketdyne Division.

the GAM-97, advanced air-to-ground missile for the Air Force B-52.

Both missiles and aircraft depend on automatic control systems—the electronic eyes and ears of the Space Age. Autonetics Division is producing these vital systems in quantity—with complete reliability.

The new weapon-system concept

America now shapes its defenses around complete weapon systems, each designed for a specific role. Some will be guided to target by electronics; others will have a human pilot's ability to choose place or report results. NAA builds both—and both are needed for complete security.

Los Angeles Division is building two advanced manned weapon systems for tomorrow's Air Force: the E-36, which will have global range (nearly more than 2,000 mph), and the F-108, which will intercept would-be

invaders far from our shores—and give us the reach to squash little wars before they become big.

Toward a brighter tomorrow

Many of North America's people are working on projects that seem like a more abundant life for a world at peace. The Aerospace International Division, for example, is developing practical methods for turning atomic energy into low-cost electricity. Two major power reactors are already in operation, a third is on the way for fifteen Southwest utility companies.

Today, in North America and its divisions, you'll find no better combination of scientists, engineers, and production men or any in aerospace industry. Because they are constantly bringing ahead into vital new technologies, much of their work holds enormous promise for science and industry.

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NEW



NEW TYPE 6 SERVO MOTORS

Here's one of the smallest precision servo motor series currently available. The new Daystrom Transistor Type 6 Motors are wound for 25-, 33-, and 50-volt operation. Control phase is center tapped for operation with transistor drive. These Motors develop .225 oz-in. max. stall torque and 6300 RPM free speed. Each unit weighs only .9 oz. and is less than 1 1/4" overall.



NEW TYPE 8 INDUCTIVE POTENTIOMETER

This Inductive Potentiometer is an infinite resolution a-e potentiometer whose output voltage is linear rather than sinusoidal with the angle. Output voltage phase is dependent upon the direction of shaft displacement from null. When operated into load resistors not less than those specified, output is linear within ±2% through an angular rotation of +80° (through null to -80°).



NEW TYPE 8 SYNCHROS

The new Daystrom Transistor Type 8 Synchro Line consists of transmitters, control transformers, differentials and repeaters. Dimensions equal to BuOrd Spec 8. Operation: 115V 400 cycles or 26V 400 cycles. Accuracy of ±10 minutes is standard. Other accuracies are available upon request. Corrosion resistant construction throughout. Conforms to MIL-E-3273-A. Operating temperature range is -34°C to +125°C. Higher temperature units also available.



NEW TYPE 11 INERTIAL DAMPED MOTOR

Here's inertial damping with no reduction in no-load speed! This new Type 11 Motor (BuOrd Spec 11) provides acceleration or deceleration damping in high-speed and high-gain servo systems. In non-critical applications, this motor can be used as a low-cost substitute for damping motor generators.

DATA SHEETS AVAILABLE. Write for complete specifications, mechanical data, dimensions and characteristics. Be sure to ask about our New 24 HOUR SERVICE for servo motors and motor generators.



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FILTER CENTER 22222

- **Solid-State Switching Device**-New type of solid-state switching device consisting of three diodes in a junction field effect transistor has been developed by Texas' Domestic Defense Proc Lab contract (DCDL), Washington. D.C. Device exhibits properties of capacitor with breakdown voltage at applied switch 14 v., repetition rate 100 v./sec., 0.005 microseconds, and a leakage or reverse current in the kilohertz range. Open loop gain of output voltage remains close to one throughout the range. Current drain is low, and no auxiliary bias or power supply is required.

- **New High Temperature Resistor**-New high temperature resistor film, consisting of carbonized film of charlene, is suitable for operating up to 1200°C. has been developed by Battelle Memorial Institute. Material undergoes less than 10% percent change in resistance over 1,000° K. at exposure at 1200°C. has temperature coefficient of social resistance per millikelvin per degree centigrade. Its range of -60°C to 1200°C. and resistance of several hundred to several thousand ohms per square may be obtained.

- **More Semiconductor Pass Cells**-Circuit Electric Co. has cut price of pre-production samples of its new silicon controlled rectifiers by 30%.

- **Manned Orbital Test-Sat**-Formosa Navy project to evaluate saturated capabilities of man in space. One U.S. team has been completed, comprising safety tests on circuit cards, then conducted at Pyle's Peak on California. Test was run at Air Force Missile Test Center, Florida, using both land and ship-based radiation sources. Air Research & Development Command sponsored program.

- **Toronto Doctor-Bird**, that year a British Valentine fighter made a night flight from Galt, Ontario, Canada, over the U.S. as far south as Cape Hatteras and west to Cincinnati, using the back coverage of the pair of Decca transits in Newfoundland in a navigation aid. Signal is said to have been good throughout the flight and altitude high, although without a receiving station in the U.S. track information only and no altitude data could be obtained. Nevertheless, Decca Systems installed for evaluation of Decca system every route between Gander and Prestwick.

- **Signal Oil Dotted Line-Major contract awards recently announced by various Government agencies**
 - **Ford Instrument Co., Division of Signal Oil Company**, has received \$14 million Navy contract for production of Mark 113 guidance computers for Tomar and Mark 119 computers for Tomahawk cruise missiles.

- **Sperry Gyroscope Co.** has received \$7.5 million Navy Bureau of Ordnance contract for production of the missile guidance status and attitude system.
- **Lichtenstein Electronics, Inc., Boston**, has received \$3.5 million Air Materiel Command contract for its AN/APN-105 Doppler radar airborne navigation system.

- **Consolidated Avionics Corp., West Babylon, N.Y.**, will design and produce missile check out equipment for Navy's Polaris intermediate range ballistic missile under a contract from Lockheed Missiles Systems Division. New equipment will check out the missile's 2000-mile range in 20 minutes.

- **Oregon Radio & Television Division of The Singer Corp.** announced STB-810 contract to develop airborne and ground recording and data handling equipment for Air Force's AN/ALD-3 "Till-Tom" reconnaissance system. Oregon is a corporate associate of Hoffman Electronics.

EXPERIMENTAL TEST PILOT

position open at Bell Aircraft Corporation, Buffalo, New York. Experience jet and fighter aircraft experience required. Formal education background and experimental or preference flight test experience desired.

Send resume of qualifications with flying time breakdown to:

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NEW ISSUE

JUNE 16, 1958

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AERONAUTICAL ENGINEERING



T33-POWERAIRB: Model 107A is tested used by Vertol to check out design features of new helicopter, also is a demonstrator.

Vertol Unveils Twin-Turbine Model 107

By Ervin J. Balbus

Madison, Pa.—Prototyp, of a new multi-role transport helicopter designed to put commercial inter-city scheduled passenger operation on a par with air travel, will be publicly shown starting for the first time this week, by Vertol Aircraft Corp., at Philadelphia International Airport.

Aviation configuration of the new 180-mph Vertol 107 (AW Feb. 27, p. 23) which the company expects to have

ready for delivery in 1962, will normally seat from 23 to 25 passengers. With high-density seating up to 30 passengers will be possible. The northern manufacturer of the U.S. Army Transport Corps will have priority for the 22-passenger plus crew commander's 23-kilometer-per-hour maximum range.

Load-carrying are the general Army's financing that General Electric government version is that the 1,000-hp plus turbine will provide the MDC-1 with higher performance capability, particularly in the single-engine condition.

Each seat will contain cells for delivery of loose apparel powered by four General Electric T56 and three with Lycoming T53. The latter contract award to Navy, Sikorsky and funded by the Defense Acquisition Corps, totals more than \$10 million.

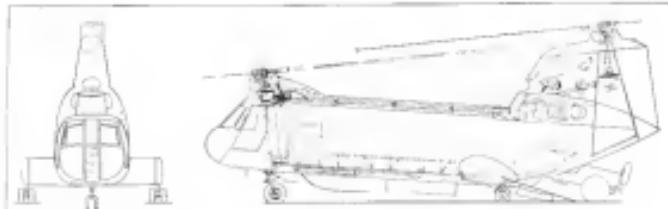
Load-carrying are the general Army's financing that General Electric government version is that the 1,000-hp plus turbine will provide the MDC-1 with higher performance capability, particularly in the single-engine condition.



AVANT COCKPIT (left) of Avant-YHC-1 shows dual control layout with instrument flight panel. Full-length transparent panels on either side of cockpit may be pivoted for equal exit. Cabin mockup (looking forward) has enclosed roll-top door on right side.



AVANT CABIN (right) of Avant-YHC-1 has enclosed roll-top door on right side.



SCHERMATICS show components of production configuration (107-seat version, below) and smaller 107A testbed (shorter) prototype; low engine disk shaft will be lowered between main turbines with longer, vertical ratio shaft positioned in caged pulns.

that the Lycoming T53 can provide at its current \$25,000-dry-lb rating.

Civil helicopter operation will require two-engine out capability in this class of helicopter and Vertol is confident that when an 107 is made for the airline market in 1964, it will also be available in the 1,000-hp plus plus providing alternative customer with a choice of either engine.

In its civilian configuration, the 107 will be strong with its forthcoming main turbine Allison 501 for putting in the next generation of transport helicopter, not only among current operators but also those who have been holding off entering the field until insurance of sufficient capacity to be reasonably insurable became available.

Testing at Vertol is that the new class of helicopters can be expected to have an impact on the helicopter industry similar to that provided by the DC-3 in developing transport operations.

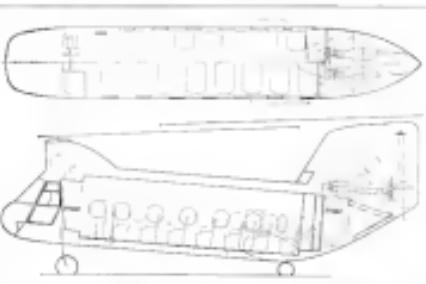
Strong Competition

An indication of the heat of the competition came as when the Model 107 and 861 mc engaged, Vertol's management a little over a year ago authorized production of the project solely with company funds. Estimate it has spent some \$1.5 million on a development program which has eaten through entire profit.

One is an attempt to gain a jump on the competition by having a prove of demonstrable hardware. Being as soon as possible, the 107A testbed configuration was produced and started its flight program in April passing out its minimum design features of the project.

Sikorsky's S-61 is not expected to roll out until next year.

Model 107A is slightly smaller than the production configuration, aircraft represents as early stage of the 107 development, set in class enough to provide useful engineering test data and



REAR LOADINGS RAMP has lowered down retracted up to cargo deck to provide 70 cu. meter clearance. Ramp can be lowered to permit carrying loads longer than 20 ft, when closed down.



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MODEL 201-A



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TOGGLE
CLAMPS



CONTROLS and transmission shafts are housed in front of empennage for optimum accessibility. The aluminum biplane panels provide an access to main head and the various engine compartments without entering the fuselage.

provides a flight vehicle for checking out production model features.

One feature of the 107 seems Vertol's HUP series. The main rotor layout provides landing gear that can be folded up out of the center area.

In discussing characteristics of the new helicopter, Robert C. Wren, Vice President-Engineering, Let L. Douglas said that this aircraft is a prime example of the 107 having a considerably larger cabin area than 930 or 600. Thus the parallel H-21—about 600 cu. ft.—although the fuselage is eight feet shorter in overall length than the H-31 and only eight feet longer than the HUP.

Other main points of the 107's design pointed out by Douglas:

- Full cross-over rear landing gear provides rapid loading of vehicles, in clearing the area's three-quarter ton payload.

- Hydrodraulic operated ramps, which can be extended from the cockpit or by a rear attendant, is designed to provide a clear height of 70 in. from the cabin down to the ground. Ramp can also be positioned at any desirable angle in prior storage of cargo that will project from the aft end of the cabin, or can be removed.

- Safety feature provides placement of all fuel in puncture-resistant bladder-type cells in external tanks designed to



CLAWSHIELD doors provide access to cabin compartment in 100½ sec.



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New **MicroBraz**
Sheet for Brazing Honeycomb

Vertol Model 107 YHC-1

Military Prototype

SPECIFICATIONS:

Gross weight	15,550 lb.
Useful load	6,000 lb.
Weight empty (with military equipment)	9,330 lb.
Overall length (fuselage folded)	44 ft. 6 in.
Height	17 ft. 7.5 in.
Rotor diameter	40 ft. 4 in.
Cabin	
Length	22 ft. 5 in.
Width	5 ft. 10 in.
Height	6 ft. 7 in.
Volume	795 cu. ft.
Seating capacity:	
Crew: Pilot and copilot (not to fly in pilot seat)	
Passenger: 22 troops or 15 bags	
Engines: T-54-GE-6 (with gear reduced rated 1,024 hp. (sup.) 919 (imp.)	
1 sup.—Maximum rated power	
1 imp.—Normal rated power	

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MISCELLANEOUS INSTRUMENTS
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Whittaker cracks the barrier in gyro cost, simplicity, and instant readiness

the Revolutionary Whittaker Spring Driven Gyro™

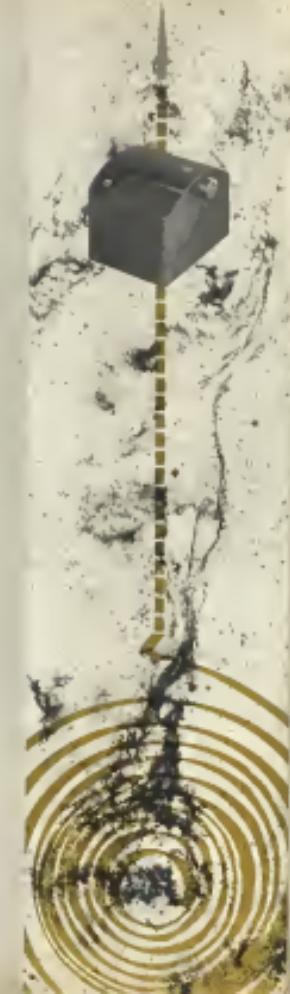
Quantity production of missiles and target drones with flight times of 45 seconds to 10 minutes brought a demand for a low-cost mechanically driven gyro that could reliably and accurately serve as a rate gyroscope, tilt, pitch, and roll control.

The goal of Whittaker's development program was to match or exceed the performance of electronically driven gyros, at 1/4 to 1/5 the cost.

Problems areas are solved, including (a) end load of mounting, which Whittaker solved with a relatively wound helical spring (b) motor design, where Whittaker is using a relatively heavy rotor turning at low speeds (c) method of transmitting power naturally to the rotor (d) structures and packaging.

The first operational use, which was designed for a flight time of 2 minutes, was so successful that it brought immediate demand for new applications. Spring-driven, real space drives for space station applications are now being built as Whittaker's first 10-minute flight times, with drift rates of 0.025° per minute, angular freedom to 360° on the outer gimbal and ±8.5° on the inner gimbal, and environmental capabilities which include shock to 100 G's, vibrations of 20 cps to 2000 cps at 10 G's, and linear accelerations of 34 G's.

The gyro is armed and caged at the factory, and hermetically sealed for instant readiness in the field. Starting time ranges from 0.1 to 0.4 seconds.



TELECOMPUTING CORPORATION
is a builder of more than 350,000 gyros, custom designed and built for existing military applications offers vapor facilities for:

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Prototype Production

Performance Testing

Environmental Testing

Quality Mass Production under equal quality control standards

Field Services

These facilities, together with the gyro industry's most complete and advanced engineering and technical personnel are at your disposal to solve your most exacting gyro problems.

To get these facilities to work for you today, or for complete information on the spring driven gyro, write or call phone Donald J. Burroughs, Division of Field Engineering, Whittaker Gyro, a Division of Telecomputing Corporation, 16217 Lankershim, Van Nuys, California Phone 874-5-2121

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PENNSYLVANIA • OHIO

nickel will be used throughout with silicon being preferred in "wings" and nickel in the "trapez". This material has been found very effective in the main pitch bearing housing of the H-21, he reported.

When on the H-21 each rotor transmission has its own integral cooling system, a single blower at the rear plus a fan and all oil for the 107% transmission system.

Powered rotor head, with air cooling, pressurized and cooling unit, will come off from top of the helicopter, the main rotor head system will be removable through the engine duct, which extends across the top of fuselage.

All-new interchangeable rotor blades will replace the existing cyclic drive system utilizing 300 mil rubber bands which have been tested successfully at Air Force's Eight AFM climatic hangar and at Mt. Washington, Mass.

With a major portion of the budget given over to initial durability testing, Vertol expects important economies in production—it is believed that the 107 structure will take some 15% fewer man-hours to build than the H-21. Fuselage will be constructional structure of aluminum alloy with titanium used in engine hot area.

In addition to new loading range, the 107 also has a close forward, on the right side just behind the cockpit, of the overhead loading bays to provide better weight savings than the tradeable type.

Loadage is designed for amphibious capability—Vertol expects to have the

107 refurbished to operate in Sea State 3 normally (the H-4 has similar capabilities). In addition, the group began to look at powerplants, to provide added floatation stability. The new helicopter is expected to be capable of operating in Sea State 4.

Cyclic will be provided with full dual and all other instrumentation, if desired including anti-torque equipment, either the Vertol-designed mechanical stabilization augmentation system or an electronic anti-torque equipment.

One of the features included in the addition, which is a seal for the loop resonance system behind helical and torsion bars, is the position that the transmission will be located in front of the eight clutch during assault operations and this has been checked with the Army and Army contractor who have communications with the troops via a load-spreader system. This close liaison between flight crew and troop commander has been proven a necessary feature in French combat experience with the H-21 in Algeria.

Vertol also implemented a panel in the floor for greater ease of loading extra externally carried cargo. This married presents a man on the cabin, using a hand hook, in engine cables tied to cargo, down them up and connects them to the cargo sling, eliminating need for tools on the ground.

Vertol feels considerable stretch possible with the present 107 configuration and reductions are to follow. Large models still maintain current one-stop loading configuration.

Killian Stresses Creative Research

Delta-More critical emphasis of the quality of U.S. research effort is necessary to make sure that research is creative and productive at possible, according to Dr. James R. Killian, Chairman of the President's Advisory Committee on Science.

Calling for greater emphasis on quality in the national research effort, Killian said "we can no longer accept all research on faith, it must reflect what we know." He spoke to learned men from Washington on the celebration of a new Texas Instruments semiconductor plant here.

Killian said that the narrow body of knowledge is complete enough to almost guarantee that a three to five year development effort should undergo no further and most likely which set "paramount to the creation of large complex systems for military and industrial use."

Despite the present capability for expansion, Killian pointed out that continuing research can be expected to develop further and less time to basic research. In the area between basic research and development, Killian said there are difficulties in supporting research work which is done now that ought could stand only another in hardware development.

magnetic, ferroelectric, electroless nickel and composite materials is already being developed into new technically significant devices. Then we have simple issues so believe that there is being generated now, and will be in the future, research knowledge that will create as ever greater solid state technology that one can see by simple extrapolation of the present."

Gordon K. Ted, Texas Instruments' assistant vice president and director of research, told the group that transistor characteristics are now understood and there is enough reason to believe that there will be enough knowledge available for new specific types.

Efforts are now being concentrated on achieving reproducibility within certain specification, improving certain parameters, increasing reliability and cutting cost. Ted observed that materials are being studied intensively and that it is believed that some of the research tools and techniques now employed will bring deeper understanding improved processes and techniques and better performance.

He noted that while the major part of research and studies effort is focused on semiconductors and silicon, other metallic compounds offer possibilities of improved operation. He listed vanadium phosphate and gallium arsenide as materials that theoretically might operate satisfactorily up to 100-400°C and said that gallium arsenide, because of its high carrier mobility, might be expected to be important in devices for high frequency microwave operation.

Noting that for broad applications, resistors must have a functional capability over a wide frequency range, Maximo Kelly, president of Bell Telephone Laboratories, and general manager of semiconductor technology, pointed out that transistor structures already show speeds over a frequency range of 1,000 mc/sec. Recent research has demonstrated an extension of this range to 6,000 mc/sec. Kelly said, and it appears possible that nonsemiconductor materials will be required that can operate at frequencies as high or higher than those of all carbon dioxide electron tube structures.

Power capabilities of 50 watts have been realized at the lower frequencies, and Kelly cautions that the power requirements of about 80% of existing electronic equipment can be handled by transistors with the current state of the art. Conducting transistors and power transistors, Kelly estimates that at least 70% of present electron tube applications are technically suitable for semiconductor protection.

Kelly told the group that were there functional advantages in needed, to accomplish this protection of 70% of electron tube applications. He said the



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FLORIDA RESEARCH AND



ISOLATION—Ten square miles comprise the site of Pratt & Whitney Aircraft's new Florida Research and Development Center. Residential shops and offices covering some 17 acres are in the foreground, while the test area, barely visible in upper left, is four miles in the background.



LOCATION—The new Center is located at Umatil, Florida, midway between West Palm Beach and Lake Okeechobee, in the upper Everglades area. It is almost surrounded by a wildlife sanctuary. Most employees live in the cities and towns along the east coast of Florida, driving to the Center on excellent new highways.

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Future aircraft and missiles may require propulsion systems far different from those in wide use today — different in size, power output, appearance and perhaps even in the basic method of utilizing energy.

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The new Florida Center, financed and built by Pratt & Whitney Aircraft, is unique in America's air industry. Here a completely six-conditioned plant with 17 acres under roof is specially designed and

equipped for the development of new power plants of virtually any type. Testing is handled in special isolated areas; the nearest town is four miles from the plant and many miles from any inhabited area. The new Center can be greatly expanded on its 10-square-mile site. Constitutional isolation is ensured by a vast wildlife sanctuary in which the Center is located.

Today about 1800 people are employed at the Center, of whom about half are scientists, engineers and highly trained technicians. By late next year, a total of about 3500 employees is anticipated.

The new Florida Research and Development Center is one more reason why Pratt & Whitney Aircraft is able to continue producing the world's best aircraft propulsion systems . . . in whatever form they take.



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AND THE 400—THE ONLY AIRCRAFT IN THE WORLD'S FIRST PRESSURIZED light twin aircraft! Comforts include on-the-ground and in-flight air conditioning and a private lavatory compartment. High above the weather, you'll enjoy cabin pressures thousands of feet lower.

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pointing stats of availability, length of life, and cost of production are made quite for successful competition in years ago.

Effective understanding and control of system design can result in both in a low cost and a long life.

Rough now, reliability and long life can be obtained by controlling the system, but the process required will so much that limit the area of application. Understanding of system of flight is expected to come with continuing research and resulting low cost processes will permit easier application.

Discussing costs, Mark Shepherd, Jr., vice president of the Sensenich Air Components Division, and that manufacturer production techniques along with new device developments, will cut manufacturing costs over the next decade and that these costs will be passed on to the customer. He predicted that the full cost of a system of navigation will be felt in 1985, and that the factor plus such developments in the plane industry which a few firms have already built, will cut production transition prices to a point where they are directly competitive with various roles on a cost basis.

Shepherd said that aircraft transponder prices will also fall as production economies are realized. He pointed out that average price of these devices has dropped 60% in the last four years and predicted that the downward trend will continue.

Manufacturer Denies P.16 Design Charges

General-Pullman Interceptor's Al Jackson (P-16) designer of the controversial Avro 748 P.16 ground effect aircraft has denied charges made by Michael Meister, Past Chairman (AWI), June 16, p. 207.

PFA staff interview Wark that the contract between them and the Canadian government agency (DRA, Kriegsmittelwerke, Berlin) was based on British requirements accepted by the Soviet as design criteria.

Consequently, it had informed R&A of changes designs, also as required by contract.

Company is still trying to get a contract order for 100 P.16s established. It was canceled because of a lack of money, financial losses from about two months after the order was placed to a rapidly van of personnel. Reasons cited for the cancellation was that a delivery delay was expected due to problems of the plant. Interceptor aircraft which was blamed for the accident to the first prototype.

Major confusion exists around the aircraft's hydraulic servo control system

maximum strength load for a return to base. In the hydraulic system the only load imposed is the amount needed to hold the aircraft surface. There is no constant leakage flow in another other types of systems.

P.16 aircraft has been tested to an interaction between the main airplane, landing gear struts and the section side of a pump of the servo control system. Primary cause of failure was the servo-control system not dependent on it.

PFA technicians plus other Swiss and foreign experts have been able after rigorous tests to duplicate the cause and sequence of the accident.

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TTS, in.	11,000	36,000
TS, in.	30	40

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ITALIAN Nibbio Fiammetta has a gross weight of 2,150 lb., cruise speed of 185 mph. Lycoming O-360 at rated at 180 hp.

Nibbio Aims at 'Second Plane' Market

By David A. Anderson

Miles-Avantiethor's F-14 Nibbio has not entered transport as being offered as a "second plane" to citizens already owning larger and more expensive twin-engine business aircraft. This idea concept is an addition to the designer's initial effort to sell the airplane as what it is—a light transport designed for European business use.

The "second plane" idea would fit the segments advanced to some features of small European cars, seems to designate fairly the high-complexion type face of the executive market.

Italian American planes, Avantethor says, the Nibbio is not in a category with the big American twin-engine executive airplanes, but that its performance and economy will make it a worthwhile investment as an alternate when only two or three people have to make short trips by air.

Company Guarantee

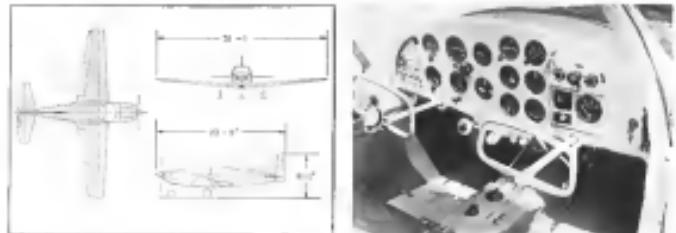
The company guarantees a 185 mph, cruise speed, and—if flown 600 hr per year as a professional pilot—an annual operating cost of just over three cents per passenger mile.

A plane worth both British and U.S.

aircraft requirements in several categories. Price is \$16,900 from Miles and optional radio equipment such as 24-channel VHF and radio compass will raise the final equipped price to \$17,000.

All cost figures are based on current prices in Italy, which are almost directly comparable to U.S. prices.

Nibbio is one of a progressive family of sport and executive airplanes designed by Stichini Fratelli well known throughout international markets and preferred by the Palazzo del Volante. Design parameters of the Nibbio was the F-14 like, a singleengined biplane squat



GARH size of Nibbio (left) = 7 ft. 6 in. wide, 7 ft. 7 in. long and 5 ft. high. There is luggage space behind the rear seat which can be reached during flight. Cockpit (right) is off-white vinyl seats of the pilot. Pilot position and instrument board are conventional.

THE SKY IS

NO LONGER THE LIMIT



Under the water...on the water...on land...in the air...and out into space...in all these areas Hughes advanced technology is being applied to vital military and commercial electronics programs.

In the space satellite field, for example, Hughes is active in the preliminary design of guidance and control systems, communications and telemetry systems, and sensing devices using infrared, optical and radar techniques.

Responsible for guiding and launching the advanced systems concepts that make this new product development possible is the Systems Analysis Division, currently involved with four Hughes projects in advanced ballistic missile guidance, space vehicle systems, and tactical missile systems. Other new programs started by Hughes Systems Analysis include advanced radar systems for all types of military and civilian applications, including RCM3 missile guidance, early warning, or traffic control, and integrated electronic systems for undersea warfare.

Currently the Hughes Research and Development Laboratories are engaged in the greatest expansion in their history. Professional opportunities have never been more promising, especially in the most recent area such as Systems Analysis.

Other Hughes services for the participating in the expansion Hughes in Fullerton is developing and producing advanced short-distributed radar systems, Hughes' unique, the commercial array of Hughes, is producing an electronic system which constitutes a complete line of machine tools.

Toddy Hughes offers Engineers and Physicians the opportunity of locating with an established firm and working in advanced new technical fields.



The wide range of activity at the Hughes Fullerton facility extends from basic data processing and simulation radar research through final design and packaging.



Analytical studies conducted by the Hughes Research Laboratories include fundamental research in the physics and chemistry of thermal systems of fusion materials and development of thermographic devices.

New professional and military contracts have created an immediate need for engineers in the following areas:

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plus that evoked much interest all over Europe.

The 1-11 follows the T-100 formula and is probably a scaled-up version of that design. It is a single-coil resistor series all-wire-wound, with phenolic and fabric covering. Power output is a maximum 0.180 watt at 150° hp driving a Hartell constant-speed propeller. Feed is 90/90 octane, current in two-stage radio and auxiliary tank with a total capacity of 55 U.S. gal.

Gross weight of Nitro is 2,510 lb.

This figure is also the maximum landing weight. Empty weight is 1,590 lb. Normal wing loading is 1.14 psf and power loading is 14.12 lbs./hp.

Emergency structure is monocoque and is broken down into two sections held together. Cabin size is 5.8 ft wide, 7.5 ft long and 3.9 ft high. There is luggage space behind the seat that can be opened during flight. Pilot position is conventional, at the maximum lateral. The cabin is large, and controls are all within easy reach of the pilot.

Wing profile is NACA 64090 series with 11% thickness ratio at the root and 16% at the tip and a trailing width ratio. Wing area is 31.2 sq ft and area w/ 1.15 sq ft. Mean high is 10.6 ft.

Truck landing gear is electrohydraulic.

With power on and the engine running the rolling speed is 11 mph.

returnable with a mechanical stability switch.

The 1-11 follows the Nitro formula in that it is of minimum and maximum of the entire cabin layout. Cockpit shoulder is roomy, and simple. The living space 2,000 square feet. Inside the plane floor and stairs of each cockpit, an additional 200 sq ft, makes 300 sq ft turn possible. With nose-wheel steerable by the rudder pedals ground maneuvering is easy.

Takeoff Data

In takeoff with 30 deg. flap deflection, nose-wheel leaves the ground at an indicated 47 mph, and the plane is airborne at 51 mph. Ground roll distance is 900 ft.

Climbout after takeoff with maximum continuous power and the air plane in clean configuration to 1,200 ft at an indicated speed of 700 mph. With gross power this rate is reduced to 700 ft.

Static and dynamic stability is positive, and characteristics are good.

Stall warning is a building that starts about 10 mph above the stall, and at altitude is not more than 10 ft.

With power on and the engine running the rolling speed is 11 mph.



Chemical Dispenser in Production

Knife-shaped, perforated dispensing wort mounted audio wings of stainless steel and aluminum are designed to permit plane to spray dust and seed or fertilizer by simply cutting a cockpit control, allowing small fine low-consuming dispensing chamber. Seeds may be sown from 50 ft to 180 ft. flow rates can be modified from one to 150 g/min, the modulus of the wort. Spherical dispensing unit. Technical Aircraft Agency. Designed by various model airplane for Schenck. Spherical unit consists of a stainless steel, corrosion-resistant assembly made up of four outer panels and a center section in which material is stored and ignited. In the front of the unit is an air intake taking 100 cu. ft. of air per minute. On top of the unit are provisions for dispensing dust and liquids, water-cooled are lowered to release pollen and seed. Complete installation weight about 115 lb.



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The latest Rolls-Royce Avon turbo jet engines in squadron service have air cooled turbine blades. This feature permits the use of higher gas temperatures, giving an increase in thrust per pound of engine weight, without affecting blade life.

The proving of this advanced feature in squadron service has established its basic reliability and air cooled turbine blades will be incorporated in the later marks of Rolls-Royce turbo jets and prop-jets for civil air transport.

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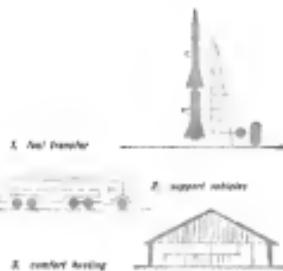
For missile ground support applications this compact new Arnold liquid heater delivers heat up to a rate of 1 million Btu/hr. A complete variable output heating system, it automatically maintains liquid at any desired temperature ...

This 257 pound package is ideally suited to such applications as heating missile fuel during storage and transfer, vaporizing liquids, and in a wide variety of support vehicles and buildings. For both material and personnel comfort heating, the new Arnold liquid heater is a simple, trouble-free way to get large quantities of controlled heat.

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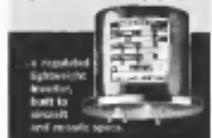
Wherever heat is needed in missile support equipment Arnold has already had what you need. Contact your Arnold representative now for the full story on liquid heaters. Janitrol Aircraft Division, Service Combustion Corporation, Columbus 16, Ohio.



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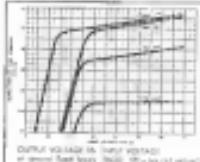
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- Constant output voltage as load varies from 0 to 100%.
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- Worldwide short circuit reliability.
- Worldwide input voltage tolerance of 70 volts for 0.1 sec. and 90 volts, indefinitely.
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D.C. OUTPUT Model 301-A	
Rated Voltage	12.00 ± 0.01
Rated Current	1.05 ± 0.005
Input Power	10.00 ± 0.05
Regulation	± 0.02%
Line	± 0.02%
Load	± 0.02%
Drift	± 0.02%
Size	1.05" x 1.05" x 1.05"
Weight	1.05 lbs.

A.C. OUTPUT Model 301-BG	
Rated Voltage	12.00 ± 0.01
Rated Current	1.05 ± 0.005
Input Power	10.00 ± 0.05
Regulation	± 0.02%
Line	± 0.02%
Load	± 0.02%
Drift	± 0.02%
Size	1.05" x 1.05" x 1.05"
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ARNOLD NEWS July 7, 1958

four months of 1958 business plan. Budget for the year 2,515 airplane sales at \$47,500,000 compared to 2,706 valued at \$53,970,000 shipped for the first quarter of 1958.

Some 36th National Flying Contests & Competition Exposition Aug. 22-23 will be held in Memphis, Tenn., where planes being made to recommendations up to 100-volt ratings under EC 3 are well over the 2,500-ft gear rating between Bushnell Station and Milton S. Hershey School International Harvester plant in route. 3,000 visitors of National Flying League Ann.

Hickman service has been established between Memphis Airport donations Balcony Room at Kress International Airport with flights operating from 7 to 6 p.m. Transoceanic Bells are being used constantly, but the operation is much more interesting using eight-passenger cargo. Trip between the airports in helicopter takes 15 min.

Safe Flight Instrument of Canada has opened production, repair and research facilities at Toronto Airport, Victoria Ontario.

Dick Kalbfus, major helicopter (AW) Apr. 26, 1958, 40,000 acres with road to 10,000 ft long, and the space of 1,000 acres in 40 ft high fields, with road 100 ft from field, with road 100 ft from highway "B" ft. Operation is part of reclamation project in the Wimberneau District, an official reclamation which purchased one of the first Kalbfus.



N-1000 CS-5 cross pointer indicator, used in conjunction with N-1000 transducer used for Serviceable 1010, 1110, or 1210, will provide pilot with information from four VOR, ILS, locator position, glide path indication, incline leg selected, and approach course information plus indicator leg status. Indicator fits in a standard three-inch enforcement control and is 21 in. deep. CS-1000 resolution weight index on panel will be available this summer, same 500E. For CS-5A, which did not include glide slope indication, is now priced at \$465.

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Forward resume to: J. L. Hobel, Industrial Relations Manager, Rohr Aircraft Corporation, Chatsworth, California, Dept. E



WHO'S WHERE

(Continued from page 21)

Changes

Adrian F. Fleisch, manager, C1650 production engineering, Commercial Engine Operations, Aircraft Cut Testicle Division, Convair Division, San Diego, Calif. (Also A. S. Johnson, manager testfire, Propulsion Engine Department, and M. R. Rose, maintenance supervisor and chief, Convair Division, Convair, El Cajon, Calif., Convair Division).

George M. Flanagan, assistant vice president, Textron Worldwide Corp., San Angelo, Calif. (A. A. Brink, the company's new president, has been promoted to executive vice president; Fred M. Flanagan becomes executive vice president of the Textron Corp. operations division).

Charles G. Hobel, directorship, sales group, Avco International Inc., San Diego, Calif.

John Vial, vice president and manager, Good Roads Division of Lear Inc., White Plains, N.Y.

Lorraine Verne Goy, George D. and V. Verne Goy, has been promoted to sales and marketing manager. Joseph P. Leto, general sales/marketing manager, Fred N. Decker, chairman of the company's F.A. Cleveland plant, that advanced design aircraft E. B. Gosselin, polymer design director.

De George B. Seana, chief of engineer psychology, Loral Aviation Inc., Long Island, N.Y.

Stephen W. Cell, director, Civil transportation, National Bureau of Standards, Washington, D.C.

James R. Marshall, director of research, Kaman Aircraft Corp., Bloomfield, Conn. Mr. Marshall continues as assistant vice president, also Frederick L. Thompson, senior vice president.

John C. Weller, distinguished industrial writer, offices, Los Angeles, Calif.

The Budd Co., Philadelphia, Pa.

Ron McCorkle, technical advisor, aerospace, the Martin Chemical Division of Borg-Warner Corp., Indianapolis, Ind.

Howard N. Shulman, sales manager, Onyx Corp., Los Angeles, Calif.

Worldwide Magazine, product manager, paper sales, Van Nostrand Reinhold, New York City.

C. J. Thompson, director sales, automotive, electrical and instrumentation, Division Electronics, Filter Controls Co., Andover, Mass.

Ralph P. Paden, manager, established government sales office, International Resources Co., Philadelphia, Pa.

Walter J. Monk, director of sales, east, Interavia West Inc., West Seneca, N.Y.

John E. Egan, senior director of publications, National Airlines Inc.

George M. Thomas, vice president, San Diego Transmission Corp., White Plains, N.Y.

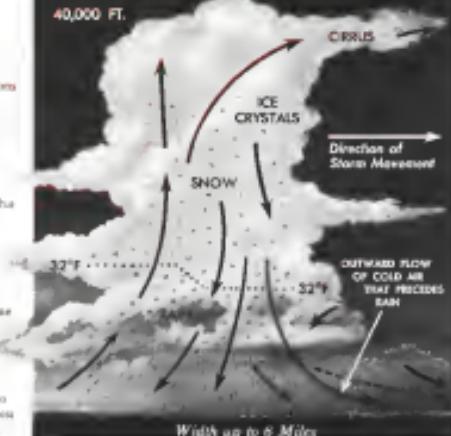
Jack D. McMillin, vice engineer, Fluor-Jordan Engineering Company of California, Inc., San Carlos, Calif.

Joseph H. Fitzpatrick, general manager, Convair Air Lines Inc.

FLY WEATHER-WISE

These weather items prepared in consultation with the United States Weather Bureau

THUNDERSTORMS



Since most fliers avoid thunderstorms, they usually do not consider the fact that they usually have to be reckoned with when en route during take-offs or landings. Designing a flight itinerary therefore becomes of extreme importance.

Note the wedge of air cooled as it passes along the ground ahead of the storm. It is this mass of air that creates the greatest hazard to planes maneuvering in the vicinity. Very sudden wind shifts can develop life momentarily and sudden drop in temperature can obviously affect engine performance. Cold downbursts precede and accompany heavy rain and are usually followed by upbursts in rear portion of storm.

Maximum turbulence occurs in regions of heavy rain where downdrafts is caused to updraft. It is concentrated between 32,000 and 30,000 ft. Maximum hail occurs between 10,000 and 15,000 ft, sometimes in close and fast moving clouds.

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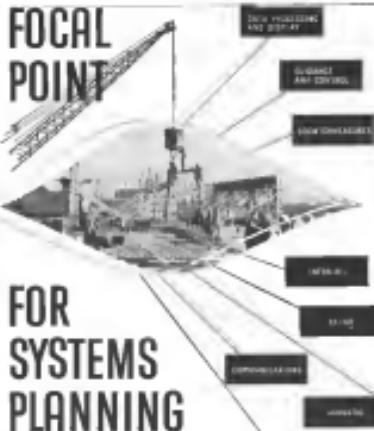
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It will help to keep our readers interested in this advertising if you will acknowledge every application received, even if you merely return the letter of unsuccessful applicants with "Postnet filed thank you" written or stamped on them.

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SPS Sleev-Lock Blind Fasteners compare well with NAS 4091, can be repeated after drilling and reused. Priced in flush or hex head types, they come pre-assembled and can be driven at rates up to 20 a minute, cut fastener installation costs as much as 50%.

New SPS Sleev-Lock Removable Blind Fasteners Help Cut Airframe Assembly Costs

SPS Sleev-Lock blind fasteners are supplied preassembled. All you do is insert them in holes drilled in panels or bulkheads and drive using an inexpensive adapter to a power driver. They can be installed by one man from one side of panel at rates up to 20 a minute, with resultant savings in installation time, cost, and labor. In addition, there's less assembly inventory, present less parts, and speed handling.

Sleev-Lock fasteners can be removed easily as they are installed, simply by reversing the driver. They can then be stored — something that is impossible with ordinary blind fasteners, which must be drilled out to be removed. Sleev-Lock fasteners thus extend the speed and economy of blind fastening in aircraft structures that have to be disassembled periodically for service or repair.

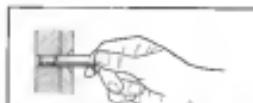
Besides economy and economy, Sleev-Lock blind fasteners offer a high degree of reliability. They can be subjected over and over again to high-strength shear loads (NAS 4091 in existing design). Shear values, comparable to those for solid bolts, range from 99,000 psi up, and tests indicate good fatigue strength and vibration resistance.

Sleev-Lock blind fasteners are available in flush head or hex head configurations in titanium, heat-resistant stainless, or aircraft alloy steel. Sizes from $\frac{1}{4}$ through $\frac{1}{2}$ in diameter in $\frac{1}{16}$ in. length increments. For more information, write Aircraft/Military Division, STANDARD PRECISION SCREW CO., Jenkintown, Pa.

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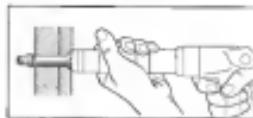
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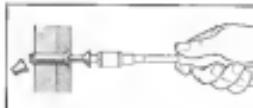
Inserting. Preassembled Sleev-Lock consisting of sleeve, cone body, and threaded shank is inserted from one side of work. Cone can also be pressed blind or underdriven if desired.



Driving. Simple adapter for driver holds sleeve stationary, turns cone body, driving nut over end of sleeve, driving work home. Extended portion of the hex head insures positive location and grip to insure mounting. Cone and nut has location locking feature, keeps lock securely.



Removing lock. Driver is reversed to break lock and pull off nut. Nut held in retaining lock feature; a Sleev-Lock does not have to be drilled out to be removed.



Removing cone body. Removal of sleeve, hex, and cone body bolt can be removed. Since no draw studs are used — fastener is totally loadable and preferable to induction of a hole and grit that results from drilling. Cone body is easily removable and, with cone bolt, can be reused with new sleeve.



All SPS are supplied in dynamically balanced, cold-drawn, heat-treated, aircraft quality materials. Our drivers will always have the high reliability factor required by today's faster speeds, longer life, and greater reliability requirements. By using SPS fasteners in your assemblies, you upgrade overall reliability — the last family of products for performance under severe service conditions.

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